

# Compressed Air

APRIL 1955

## Magazine

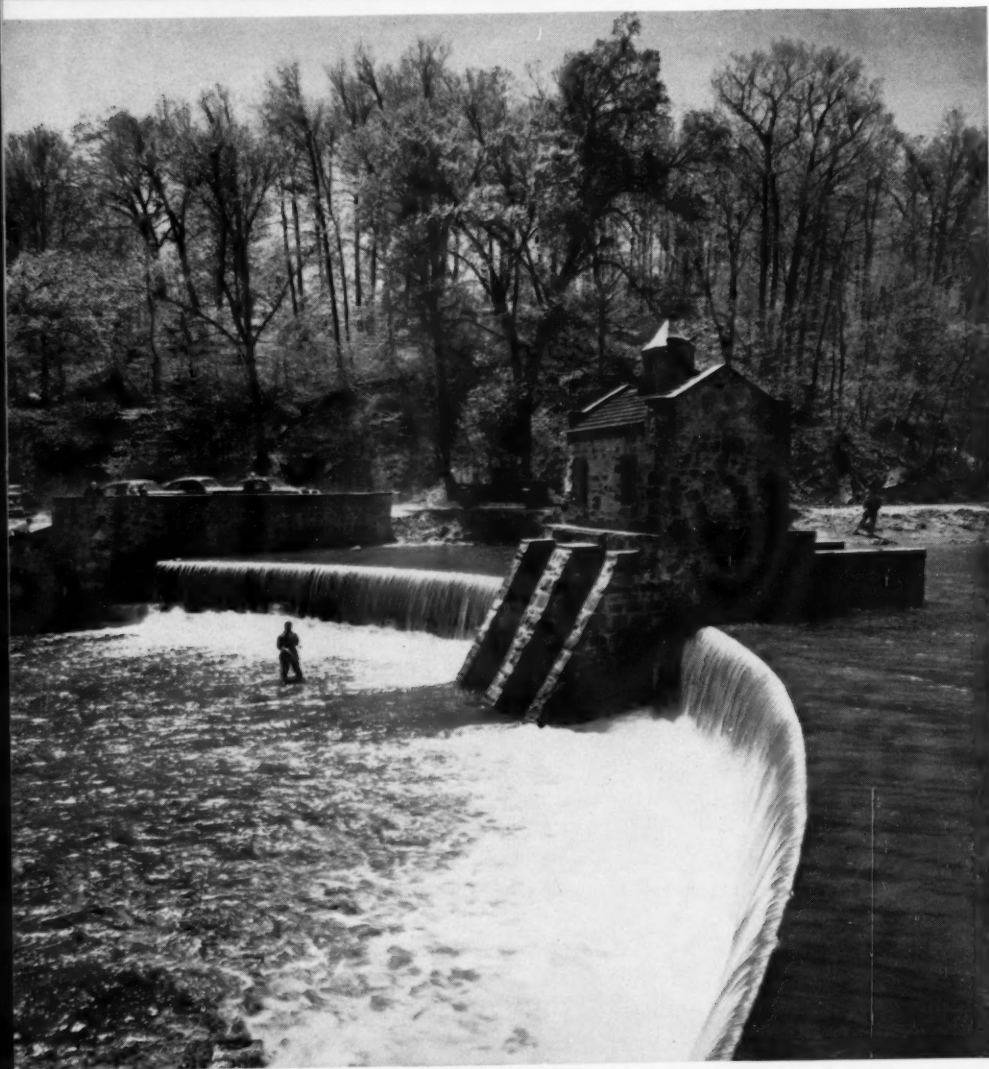
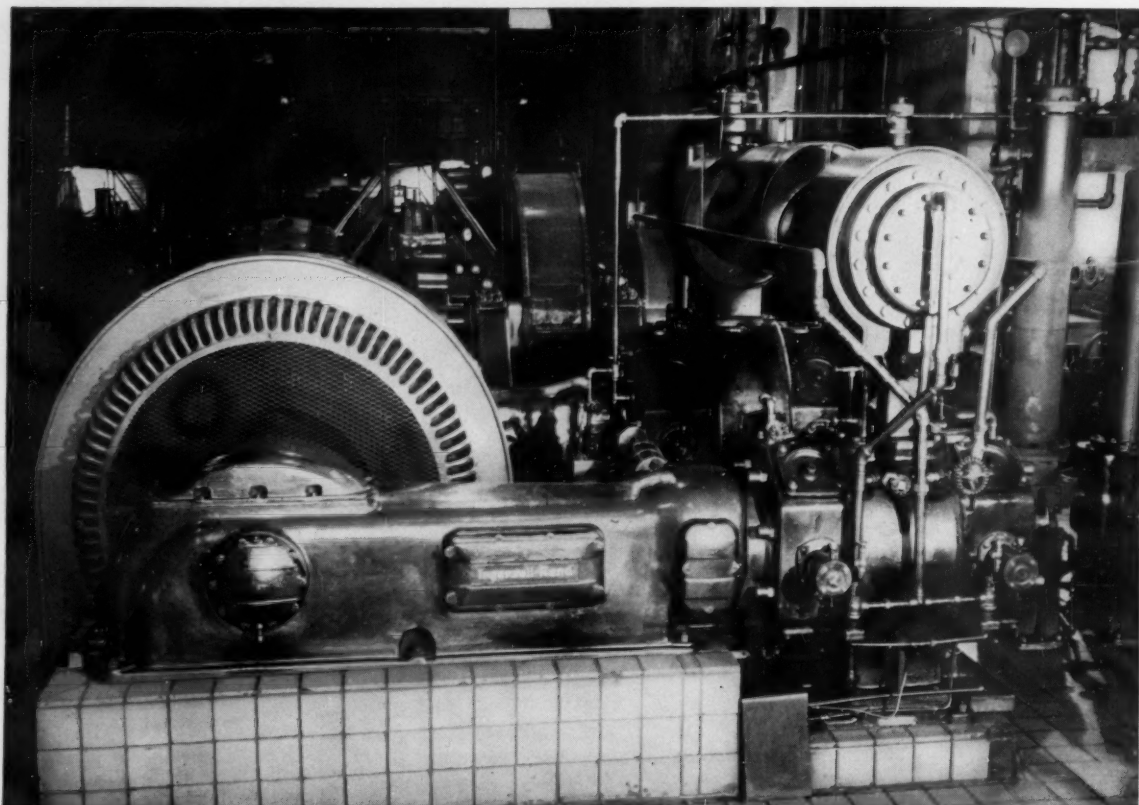


PHOTO. A. DEVAHNY, NEW YORK

TROUT STREAM  
IN NEW JERSEY  
April brings showers and  
hopeful fishermen who  
wade in cold water

VOLUME 60 • NUMBER 4

NEW YORK • LONDON



# SURE WAY TO IMPROVE PERFORMANCE

**USE** the oil that will prevent rust and harmful deposits in your air compressors and lines, that will keep piston rings free and valves clean — *Texaco Regal Oil R&O*.

Operators everywhere find that *Texaco Regal Oil R&O* assures high operating efficiency, dependable performance, and low maintenance costs. *Texaco Regal Oil R&O* is premium-quality oil, still *further improved* by effective additives and extra processing.

There is a complete line of *Texaco Regal Oils*

*R&O*. You can get one exactly right for your compressor, whatever its size or type, the number of stages, the pressure . . . whatever the operating conditions.

Let a Texaco Lubrication Engineer help you make the right selection. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street,  
New York 17, N. Y.



## **TEXACO** Regal Oils R & O

FOR ALL AIR COMPRESSORS AND OPERATING CONDITIONS

TUNE IN . . . TEXACO STAR THEATER starring JIMMY DURANTE or DONALD O'CONNOR on television . . . Saturday nights, NBC

Circle 1A on reply card



# STAYNEW

## ABSORPTION FILTERS PROVIDE

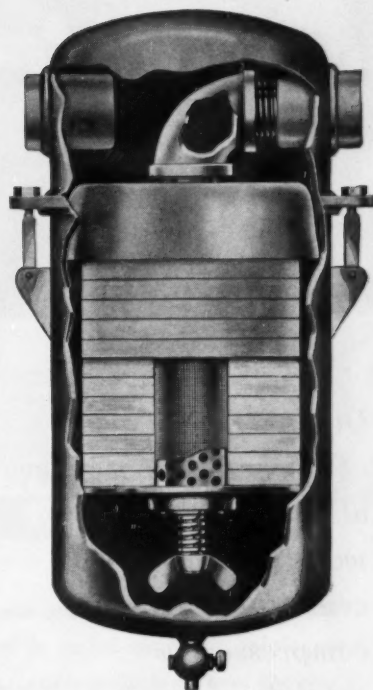
# SUPER FILTRATION!

— REMOVE LAST TRACES  
OF OIL AND MOISTURE  
FROM COMPRESSED AIR LINES

The model AAPH Absorption Type Filter has proven itself to be the real answer to the elimination of costly service interruptions in utility and industrial power plants. Many manufacturing processes and certain compressed air operated equipment require the removal of condensed oil and water vapors *completely* from the compressed air. In thousands of installations all over the country, Staynew Absorption Filters remove the last traces of oil and moisture and prevent failure of combustion and other pneumatic controls . . . keep maintenance time and cost at a minimum.

*For Complete Information, Write Today For Bulletin B-1A*

Representatives in Principal Cities



MODEL AAPH  
Absorption Filter



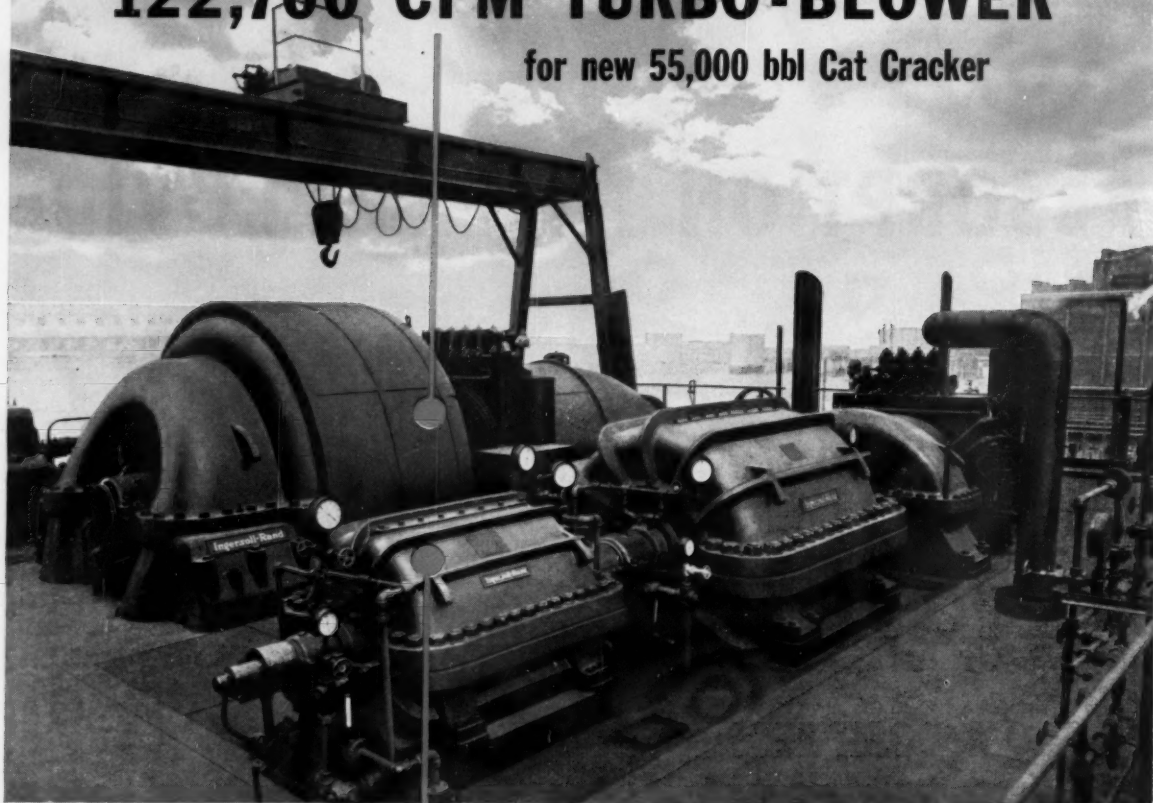
# DOLLINGER

CORPORATION

7 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

Standard Oil Company of California installs  
**122,700 CFM TURBO-BLOWER**  
for new 55,000 bbl Cat Cracker



*Outdoor Installation  
at El Segundo Refinery  
also includes the  
world's largest  
centrifugal gas  
compressor in  
catalytic service  
... both by  
Ingersoll-Rand*

**T**HIS INSTALLATION at Standard Oil Company of California's huge El Segundo refinery is unique in three respects.

The 122,700 cfm I-R Turbo-Blower shown in the background is one of the largest ever supplied for refinery service. It is a 3-stage unit, driven by an I-R 10,000 hp steam turbine, delivering air at 19.35 psig to the 55,000 barrel per day cat cracker.

In the foreground is the largest centrifugal refinery gas compressor in the world — a 6370 hp I-R unit consisting of two centrifugals in tandem, driven by an I-R turbine. Compressing gas from 4 psig to 205 psig, it delivers 20,800 cubic feet per minute.

The entire installation is out of doors.

Whatever your requirements for refinery air or gas compression, Ingersoll-Rand's unequalled experience and facilities are at your service.



**Ingersoll-Rand**  
11 BROADWAY, NEW YORK 4, N. Y.

12-191

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

# GLOBAL APPROVAL

ALGERIA

CANADA

CONGO

ENGLAND

FINLAND

FRANCE

INDO-CHINA

MOROCCO

PHILIPPINES

RHODESIA

UNITED STATES

VENEZUELA



**BUCYRUS  
ERIE**

**110-B** 4½ cu. yds.

**150-B** ..6-cu. yds.

**190-B** ..8-cu. yds.

Scores of these outstanding excavators have proven their worth in varied quarrying, mining, and heavy-duty construction projects all over the world.

Remember, FOR THAT EXTRA MARGIN — in design, in construction, in all round performance, and, above all, in output — it's BUCYRUS-ERIE Ward Leonard electric excavators.

46L55C

## BUCYRUS-ERIE COMPANY

South Milwaukee, Wisconsin





**Wire Rope at Work**—Here's an interesting operation that took place during construction of the Queens Welfare Island lift bridge crossing a portion of New York's East River. The giant sheave, weighing 37 tons, is one of a pair in the 170-ft tower at the east end of the bridge. A similar pair were placed in the west tower. Big 2 $\frac{3}{8}$ -in. Bethlehem wire ropes operate over these sheaves, providing links between the ends of the lift span and the counterweights.

The hoisting of the sheaves was no small job, but it was handled smoothly and without mishap by the erection contractor, Harris Structural Steel Company. This, like the operation of the span, is a type of work for which Bethlehem rope is ideally suited, for there is no more dependable cable made anywhere.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

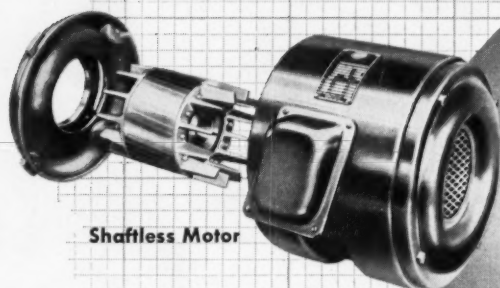
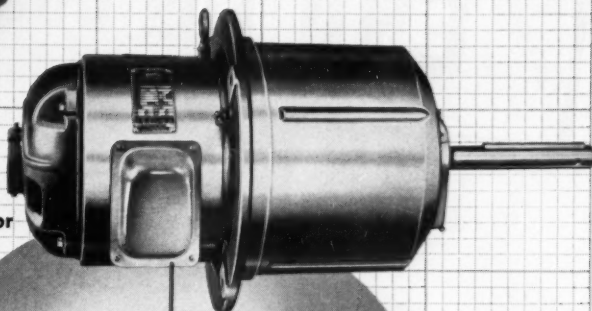
*Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:*

CONSTRUCTION • MINING • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

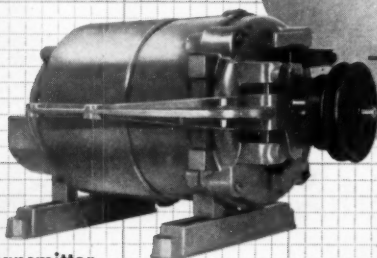


a motor designed  
for its job  
will out-perform a "standard"

Special Purpose  
Extended Bearing Motor

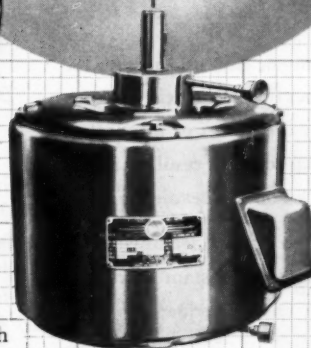


Shaftless Motor



Power Transmitter  
(Clutch-Brake Motor)

Special Purpose  
Vertical Motor



No standard motor can hope to match performance with a motor custom designed to meet unique requirements.

That's why Diehl lays so much emphasis on custom construction . . . why, through the years, it has geared its abilities and its facilities, its design, engineering and manufacturing functions for maximum cooperation with its customers . . . whatever the application.

#### DIEHL custom-tailored motors can:

Cut costs • Save space • Reduce weight • Improve safety  
Simplify design • Speed production • Improve appearance

When you want a fast, thorough answer to an unusual motor problem it will pay you to consult Diehl. Name your conditions . . . Diehl will design and build to match.

**DIEHL MANUFACTURING COMPANY**  
Electrical Division of THE SINGER MANUFACTURING COMPANY  
Finderne Plant, SOMERVILLE, N. J.

Please send me the following bulletins:

- ☐ New Type "D" Motor Bulletin No. CA-3304  
☐ Consolidated Catalog & Price List No. CA-3310

Name

Company

Street

City  State

INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES

**DEAD  
END**

**FOR DUST!**

Multi-Duty Filters clean intake air for six 2000 H.P. Worthington gas engines for Texas Illinois Natural Gas Pipeline Co., New Caney, Tex. Note use of AAF intake deflectors which assure maximum weather protection and serve to reduce shock waves emanating from air intake.



## AAF MULTI-DUTY FILTERS ASSURE CLEAN INTAKE AIR AUTOMATICALLY

**T**HERE'S a big investment tied up in these six 2000 H.P. gas engines that can quickly be torn down by dust. That's why the matter of filter selection was of prime importance—and resulted in the selection of AAF Multi-Duty Self-Cleaning Filters.

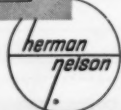
"Variables" have no place in the cleaning of intake air. Uniform air delivery, constant efficiency, low operating resistance and infrequent maintenance are "musts" for true dust protection. Multi-Duty measures up on every count because this filter keeps itself "fit" through continuous self-cleaning action.

Write For New  
"TELL ALL" Catalog



This 16-page, illustrated catalog presents the detailed story of Multi-Duty design and performance. Shows you how filter is adapted for indoor or outdoor installation—for smooth or pulsating air flow application. Capacities, dimensions, weights, installation instructions — all are incorporated to give you a clear-cut picture of how Multi-Duty solves air cleaning problems easily, effectively and economically.

Write for your *free* copy today. Ask for Catalog 150-B.

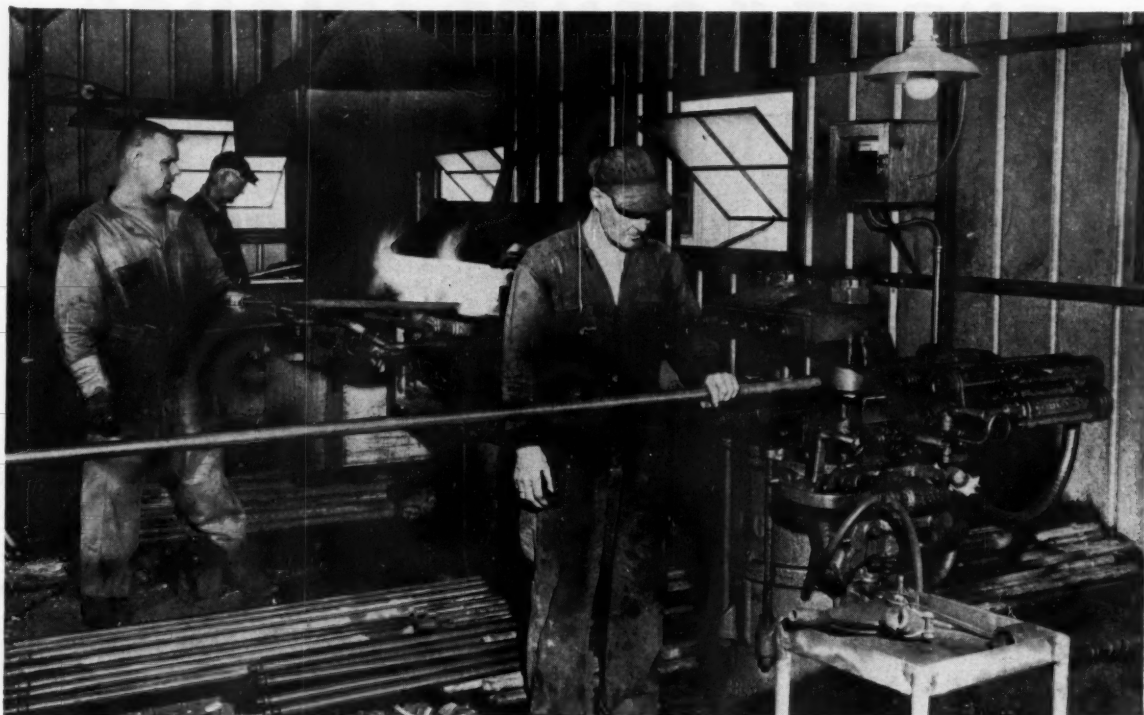


# American Air Filter

COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 402 Central Avenue, Louisville 8, Kentucky





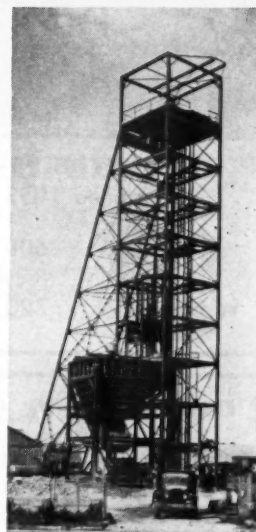
Blacksmith Billy Watkins shanking a Crucible Hollow Drill Rod.

## they're using Crucible Hollow Drill Rods on the Boston Tunnel Jobs ...

400-feet below the city of Boston, two seven-mile tunnels are being cut through solid rock. Replacing century-old mains, the tunnels will bring water from Quabbin Reservoir, 70 miles away, and remove drainage from the city.

On this job, like most other tough ones, Crucible Hollow Drill Rods are in daily use. For experienced construction men *know* they can depend upon Crucible Hollow Drill Rods for top performance at *lowest cost per foot of hole drilled*.

That's because they are made to *tool steel* standards by the nation's leading producer of *special steels*. So for *extra* dependability on *all* your drilling jobs specify Crucible Hollow Drill Rods. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*



120-foot-high head frame used to raise and lower men and materials in excavation shaft. Morrison-Knudsen-Kiewit-Maney City Tunnel Extension Job, Boston, Mass.

**CRUCIBLE**

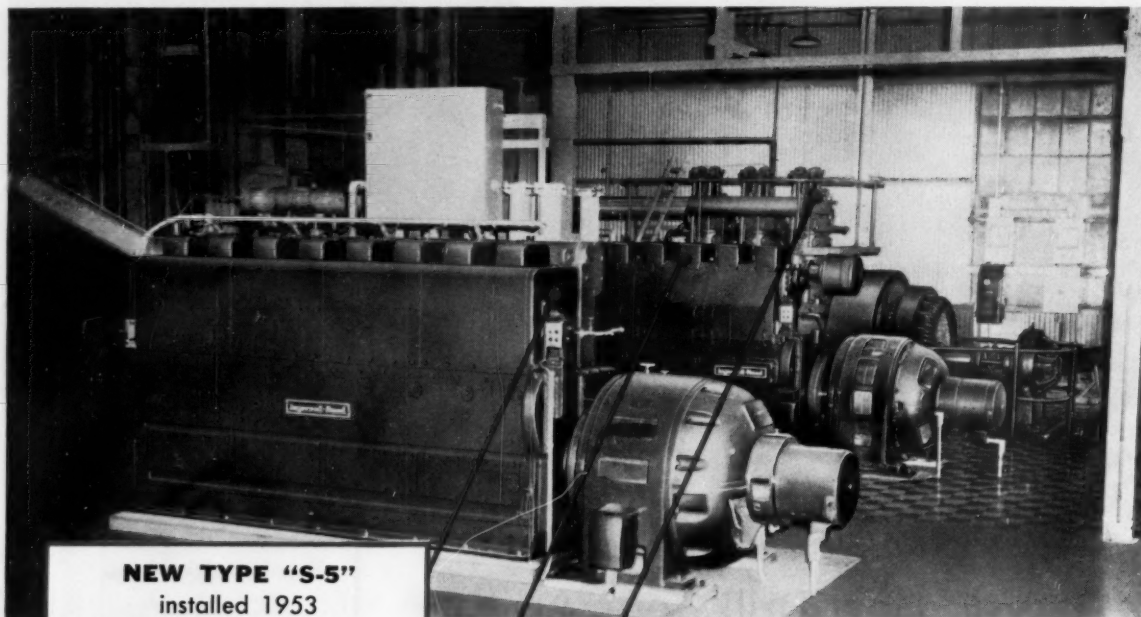
first name in special purpose steels

**Crucible Steel Company of America**

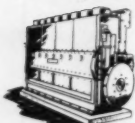
# THREE "GENERATIONS"

## of I-R Diesels supply

### dependable power in Central America

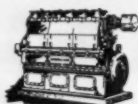


**NEW TYPE "S-5"**  
installed 1953



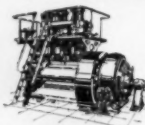
600 hp  
8 cylinders  
720 rpm

**ORIGINAL TYPE "S-3"**  
installed 1946



450 hp  
6 cylinders  
720 rpm

**OLD TYPE "PR"**  
installed 1929



170 hp  
3 cylinders  
300 rpm

*... all three units in daily service  
at Cerveceria La Constancia,  
Central America's leading brewery*

Here, in the power generation room at Cerveceria La Constancia, one of Latin America's largest and most up-to-date breweries, we see three "generations" of Ingersoll-Rand 4-cycle diesels — representing 29 years of dependable service.

The old "PR" unit, one of the first solid-injection diesel engines pioneered by Ingersoll-Rand, is still working shoulder-to-shoulder with an early Type "S" unit and a new Type "S" engine which represents the last word in modern diesel design.

This continuous service record is typical of I-R diesels the world over. Their low fuel consumption and exceptional dependability are continually setting the highest standards of performance and economy. Your nearest Ingersoll-Rand engineer will be glad to tell you more about compact, heavy-duty I-R diesels — built in sizes from 200 to 1000 hp. Ask for your copy of Form 10,040.



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COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • OIL AND GAS ENGINES



## Air hose with tube and cover of NEOPRENE resists weathering and wear on demolition job

Rough and tumble demolition work really puts air hose to the test. Men drag the hose through rubble and scrap metal, over jagged edges and around corners. The cover lies exposed all day long to every weather condition, including direct sunlight. Hose that will last on jobs like this has to be tough and flexible . . . that's why it should be hose made with Du Pont neoprene *inside and out!*

**TOUGH HOSE COVERS** of neoprene stand up to pulling and flexing without cracking. They stand up to sunlight and constant weathering . . . won't chip or tear when pulled across rough surfaces. Wherever air hose is used, neoprene covers give the fabric reinforcement maximum protection.

**NEOPRENE TUBES** help avoid slow-ups on the job, because they don't go to pieces under the attack of hot oil in the line. No particles crumble off to clog vital tool parts.

Time-saving and money-saving reasons like these explain why hose with cover *and* tube of neoprene is standard equipment on many pneumatic tools today. Manufacturers know it assures their product of long, trouble-free service. And it's the sensible choice for replacement hose, too. Next time you buy, ask your dealer to show you hose made with neoprene . . . inside and out.



### FREE! THE NEOPRENE NOTEBOOK

Each issue brings you new, unusual applications of neoprene . . . new products . . . interesting articles. Send in this coupon to E. I. du Pont de Nemours & Co. (Inc.), Elastomers Division CA-4, Wilmington 98, Delaware.

Name \_\_\_\_\_ Position \_\_\_\_\_

Firm \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

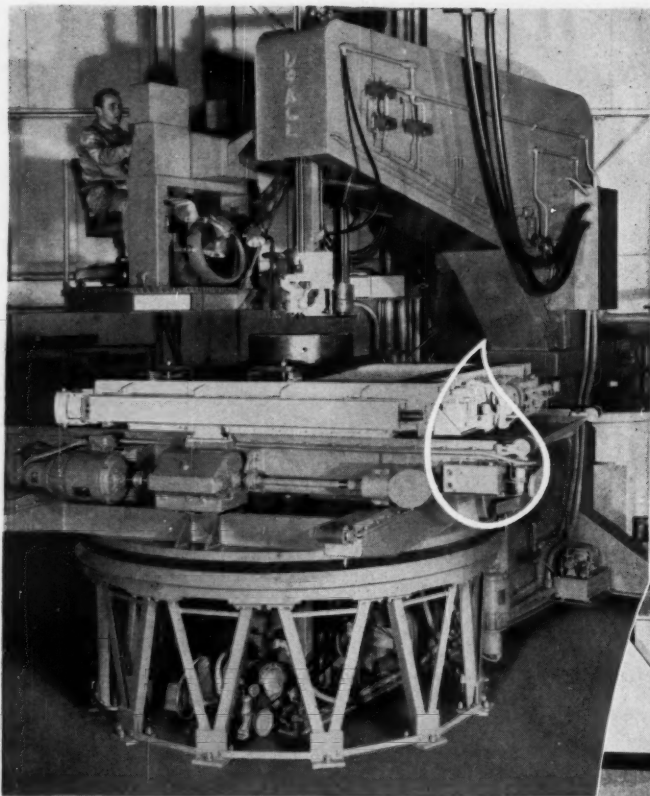
# NEOPRENE

The rubber made by Du Pont since 1932



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



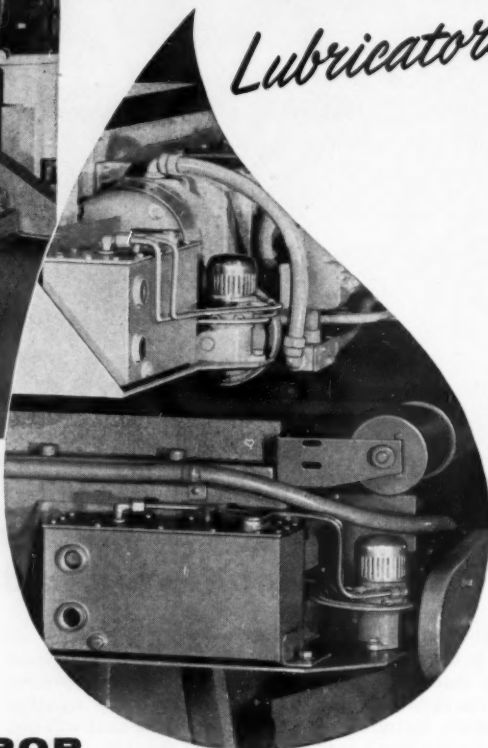


Two Madison-Kipp OL Lubricators installed on the world's largest band machine and die filer, manufactured by the DoALL Co., Des Plaines, Illinois... Operated by remote control, they machine 10-ton extrusion dies for the Air Force "Heavy Press Program."

**MACHINES OF GREAT  
PERFORMANCE USE THE  
MOST DEPENDABLE OILING  
SYSTEM EVER DEVELOPED**

**...MADISON-KIPP**

*Lubricators*



*Fresh Oil...*

**BY THE MEASURED DROP**

...from a Madison-Kipp Lubricator is the most  
dependable method of lubrication ever developed. It is applied as  
original equipment on America's finest machine tools, work engines  
and compressors. You will definitely increase your production  
potential for years to come by specifying Madison-Kipp  
on all new machines you buy where oil under pressure  
fed drop by drop can be installed.

**kipp**

**MADISON-KIPP CORPORATION**  
202 WAUBESA STREET • MADISON 10, WIS., U.S.A.

- Skilled in Die Casting Mechanics
- Experienced in Lubrication Engineering
- Originators of Really High Speed Air Tools

# COPPUS "BLUE RIBBON" VENTILATORS

identified by the blue band

FOR WORKERS'

- Safety
- Health
- Comfort
- Efficiency

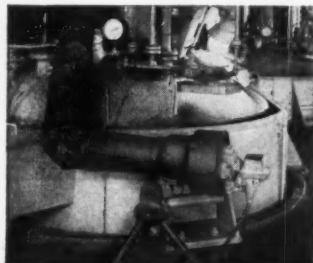
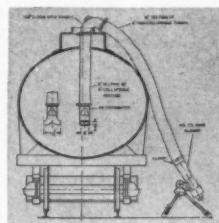
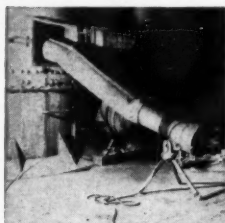
## VANO® Design "A" VENTILATOR



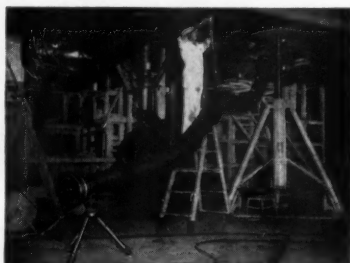
Vano Design "A" cooling interior of furnace, supplying fresh air through 10 feet of "Ventube" to provide safety and comfort during repair work.

Vano Design "A" delivering fresh air to cable manhole, expelling sewer gas, making entrance safe in a few minutes.

Vano Design "A" Ventilator plus a few accessories feeds large air volume into tank car, driving out fumes, stagnant or hot air for workers' safety and comfort.



Vano Design "A" supplying fresh air in Reactor Room of Synthetic Rubber Plant.



Vano Design "A" Ventilator supplying fresh air to men working in wing compartments, fuselages, etc.

Powered by a 1/2 hp motor, and equipped with the exclusive Coppus axial-flow propeller-type fan, this general-purpose blower delivers 1500 CFM of fresh air. It supplies ventilation for tanks, tank cars, drums, vats, underground cable manholes, pipe galleries, airplane wing compartments and fuselages, and other confined places. Weighs only 103 lbs. Uses 8"-diameter flexible canvas tubing ("Ventube").

### VANO DESIGN "C"



VENTILATOR-EXHAUSTER



Vano Design "C" equipped with 8" discharge tubing removing welding fumes.

Vano Design "C" equipped with two suction lines removing welding fumes for operators' safety.



For withdrawing welding fumes from confined places or directly from the welding rod ...or for expelling fumes or hot air from enclosed vessels. You can get it with 8" suction inlet for 8" non-collapsible tubing ...or with multiple inlet nozzles for 5", 4" or 3" suction hose. The discharge outlet takes 8" "Ventube". Powered by a 1/2 hp motor, it weighs only 85 lbs.

COPPUS ENGINEERING CORP., 204 PARK AVENUE, WORCESTER 2, MASS.  
Please send information on the Blowers that clear the air for Action.

- |  |  |
|--|--|
| <input type="checkbox"/> in tanks, tank cars, drums, etc.    | <input type="checkbox"/> on steam-heated rubber processes. |
| <input type="checkbox"/> in underground cable manholes.      | <input type="checkbox"/> on boiler repair jobs.            |
| <input type="checkbox"/> in aeroplane fuselages, wings, etc. | <b>COOLING:</b>  |
| <input type="checkbox"/> on coke ovens.                      | <input type="checkbox"/> motors, generators, switchboards. |
|  | <input type="checkbox"/> wires and sheets.                 |

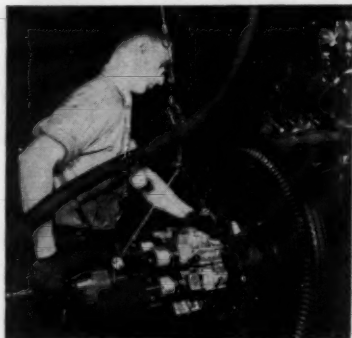
- |   |
|---|
| <input type="checkbox"/> general man cooling.   |
| <input type="checkbox"/> around cracking stills.  |
| <input type="checkbox"/> exhausting welding fumes.  |
| <input type="checkbox"/> stirring up stagnant air wherever men are working or material is drying. |

NAME.....  
COMPANY.....  
ADDRESS.....  
CITY.....

(Write here any special ventilating problem you may have.)

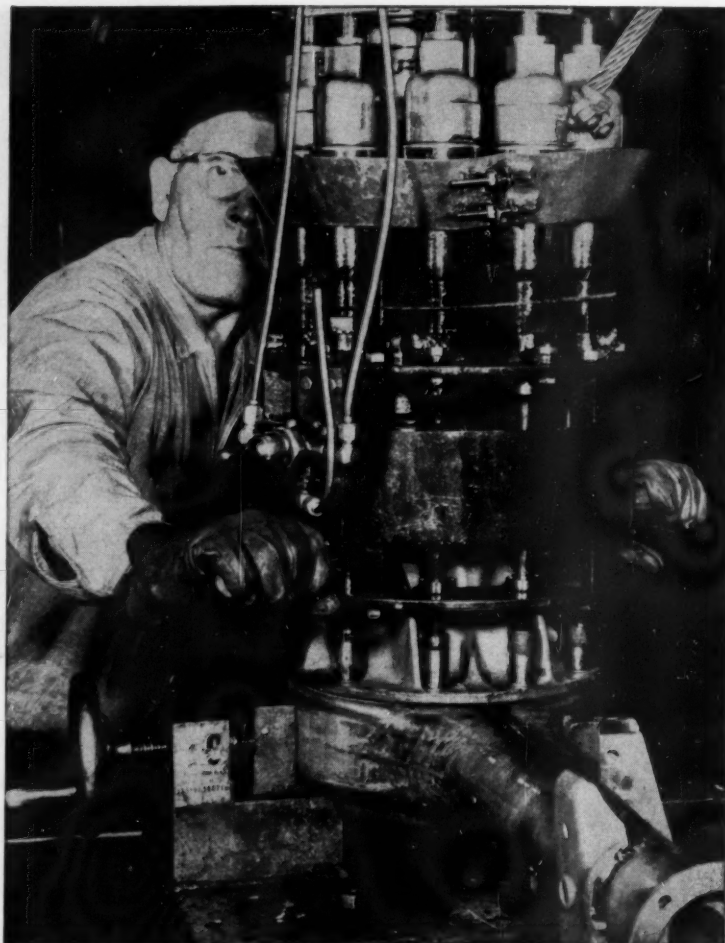
COPPUS "BLUE RIBBON" PRODUCTS—Designed for Your Industry. Engineered for You

**Nickel Cast Iron** cylinders provide desired properties to keep air-powered tools, like this one, on the job. Less maintenance and non-productive labor costs add to the worth of this 10-Spindle Multiple Nut Runner. A product of Ingersoll-Rand Company, New York, N. Y.



**Get Better Quality Control** by simultaneous running of nuts. No experience needed for controlling torque to meet specifications, when you use an I-R Multiple Nut Runner. Here's one in use, assembling wheels to axles.

**I-R Multiple Nut Runner**  
by-passes press operation



## Dense, long-wearing Nickel Cast Iron assures trouble-free performance of air motor cylinders

Here is where nickel cast iron renders help . . .

Where a large auto manufacturer by-passed an operation that required two ¼ ton presses.

Heretofore, the presses positioned a differential carrier in the rear axle housing. Ten ¾" nuts were then run on individually. But only skilled workers could draw them to meet the torque specified.

Today, the carriers are hand set to within 1/8" of the ultimate location, and then quickly drawn into position by the Multiple Nut

Runner, which runs all 10 nuts at once.

### Meets 5 Cylinder Essentials

In running ten nuts at a crack . . . all to exact torque . . . nickel alloy cast iron plays a vital role. This alloy cast iron was especially chosen, to meet five basic needs of air motor cylinders:

- Air-tight density**
- Strength to meet sudden stresses**
- Resistance to wear**
- Good response to heat treating**
- Machinable throughout**

It's one more instance that shows you how alloys containing nickel . . . alone or along with other alloying elements . . . can solve hard problems. For the properties of alloys containing nickel may be controlled to meet almost any fabricating and service demands.

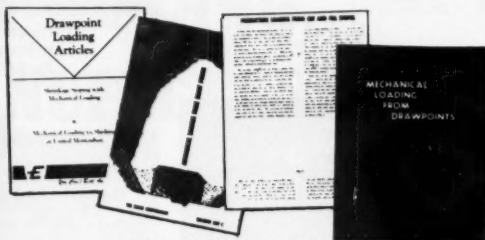
*We'll be glad to help you choose the right nickel alloy to improve performance of your products or equipment. Let us have details of your problem. We'll go over them and send you our suggestions.*



**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street  
New York 5, N.Y.



## PRODUCTION LOADING WITH EIMCOS WILL SAVE YOU MONEY



WRITE FOR L1017A-B-C

THESE BULLETINS WILL TELL  
YOU HOW AND WHY



## THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A.

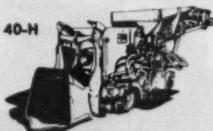
Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa.  
Pasadena, Calif. Houston, Texas London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa



B-101

40-H



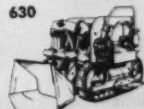
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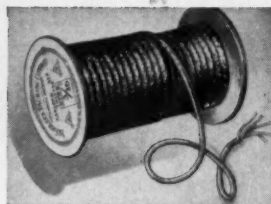




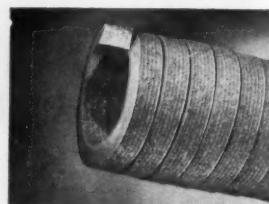
Garlock 150  
High Pressure  
Steam Packing



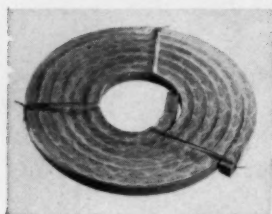
Garlock 234  
ROTOPAC Rotary  
Pump Packing



Garlock 117  
Valve Stem  
Packing



Garlock 777  
Low Pressure  
Packing



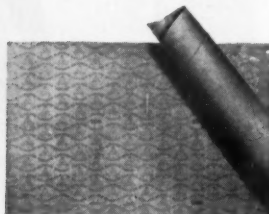
Garlock 262  
Special Hydraulic  
Packing



Garlock 730  
LATTICE BRAID\*  
Asbestos Packing



Garlock 430  
CHEVRON\*  
Hydraulic Packing



Garlock 900  
Compressed Asbestos  
Sheet Packing

## ONLY GARLOCK MAKES AND SELLS ALL THESE PACKINGS AND GASKETS

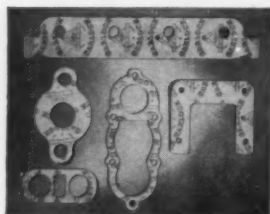
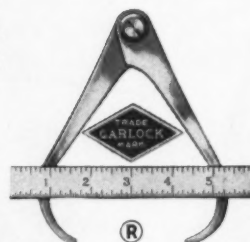
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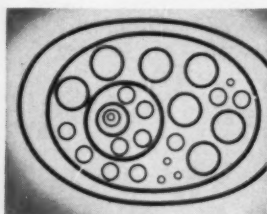
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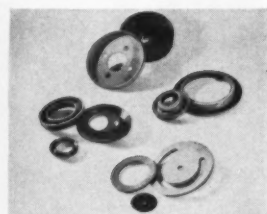
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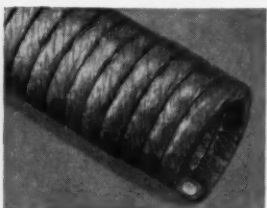
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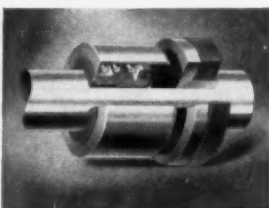
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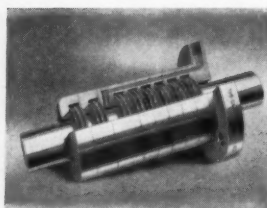
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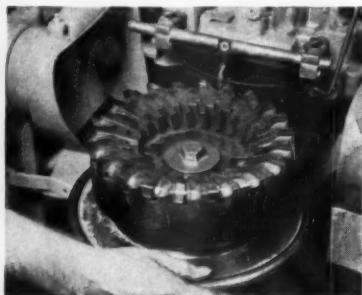
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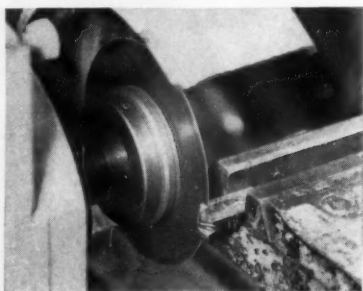
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COMPRESSED AIR MAGAZINE

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## ON THE COVER

IN APRIL the trout-fishing season opens in many states, including our own New Jersey. We can't truthfully say that on opening day the Whippany River, near Morristown, N. J., looks like it does on our cover. Actually it will be pretty well crowded with fishermen, young and old, casting everything from worms to spinners at hungry hatchery-raised trout and snaring a few of them almost out of one another's boots. But, it's still fun!

## IN THIS ISSUE

THE Soo Canal was completed 100 years ago this month, although not opened until two months later. To keep the record straight, a mild centennial celebration was launched at Sault Ste. Marie, Mich., in March, but won't get into full swing until June. Uncle Sam will take official note of the anniversary by issuing a commemorative stamp. Our leading article gives the history of the famous waterway.

GAS-distribution companies are ever alert to guard against leaky mains and service pipes and have developed effective methods of sealing joints of lines that have been in the ground for a long time. Air-operated equipment is used at almost every step of the operations. Page 105.

ATHA Albert Richie not only has a phenomenal memory but is also a good storyteller. Now 75 years old and living in Rialto, Calif., his mind is as clear as a bell and often dwells on his varied experiences as a prospector and mine operator. In this issue he recounts life in a small Wyoming mining camp when he was a lad of seven. Page 108.

SELF-dispensing pressure packs were first used during World War II when G.I.'s in the South Pacific area and then in other theaters were supplied with aerosol insecticide "bombs." Now a great many products are being packaged in that way, the latest being cosmetics. What's more, they come in glass containers, an innovation in pressurized dispensers. Page 112.

THE skyscraper is coming back! All the talk about tall buildings not being economical heard following the collapse of business in 1929 seems to have been forgotten. In any event, some lofty structures are rising in various parts of the country, with New York leading as usual. The new Socony-Vacuum Building there is the city's largest since the Empire State was constructed. Page 113.

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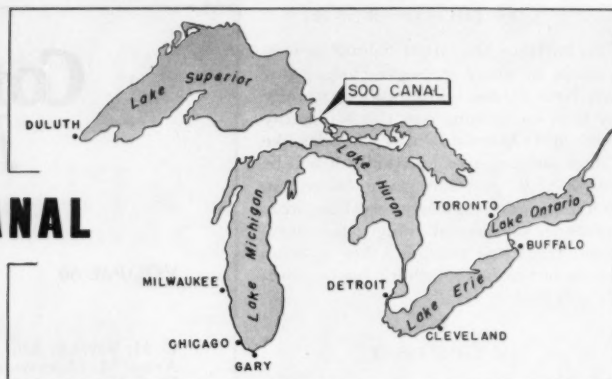
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## BUILDING THE SOO CANAL

Original Tandem Lock, Now Grown to Four, Was Opened 100 Years Ago

H. F. REVES



### LOCATION MAP

The Soo Canal handles more freight each year than any other similar waterway and around three times as much as the Panama Canal. The map shows its key location for the transportation of iron ore and grain down the chain of lakes to important steelmaking and industrial cities. Because its loss would be so crippling to American and Canadian economy, the area is protected by our strongest peacetime bastions of aircraft and antiaircraft power.

ON JUNE 18, 1855, the steamer *Illinois* passed upbound through the new St. Marys Falls Canal at Sault Ste. Marie, Mich., to open navigation between Lake Superior and the lower Great Lakes. That momentous day, which inaugurated a new era in the history of the United States, is soon to be commemorated by a gala centennial celebration at the City of Sault Ste. Marie, for no other single engineering work has had so great an impact upon the economic development of this country in the past century.

Now generally known as the Soo Canal, it has been the primary factor in the upbuilding of the steel industry by making available low-cost open-water bulk transportation from the Superior ports to the mills at Chicago, Gary, Detroit and the numerous Lake Erie ports. Iron ore was discovered in the Marquette Range in 1844 and in the Mesabi half a century later, but the older deposits were the source of supply for the new industry that now plays so dominant a part in world economy.

In 1953 ore shipped from Lake Su-

perior mines totaled 99,024,613 tons, of which 95,844,449 tons moved by water,



U. S. ARMY ENGINEERS PHOTO

### THE CANAL AND LOCK AREA

An oblique aerial photograph taken last fall and looking eastward. Sault Ste. Marie, Mich., is on the right and the Canadian city of the same name at the top. MacArthur Lock, 800 feet long, 80 feet wide and 31 feet deep, is of concrete and was constructed in 1942-43 on the site of the earlier Weitzel Lock. Poe Lock, 704 feet long and 95 feet wide, is of masonry and was completed in 1896 on the site of the original State Lock of 1855. Davis Lock, 1350

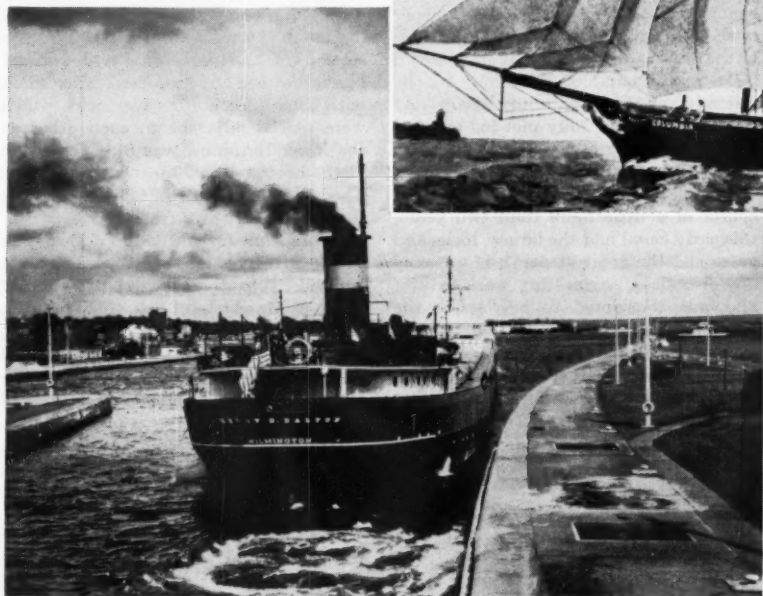
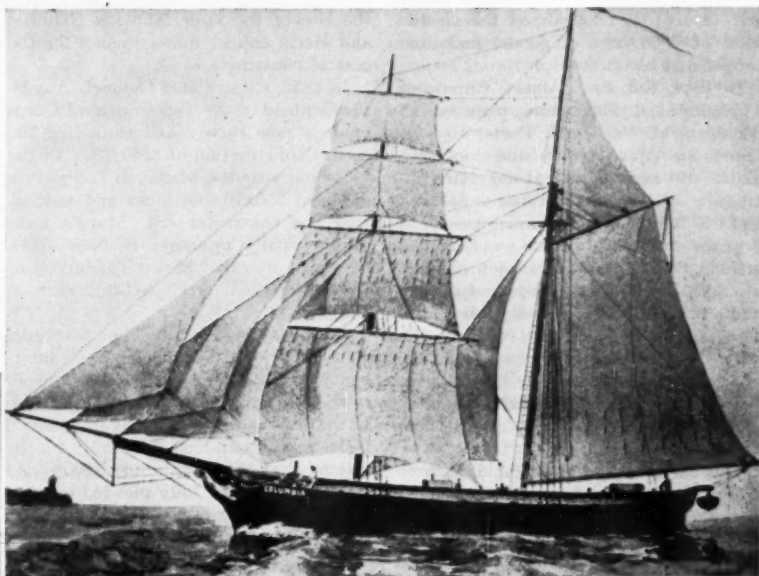
feet long and 80 feet wide, is of concrete and was opened in 1914 and finished in 1919. Sabin Lock, 1350 feet long and 80 feet wide, is of concrete and was opened in 1919 and completed in 1923. Replacement of Poe Lock with a new one was authorized in 1946 but deferred pending availability of funds. More than 2.8 billion tons of iron ore has passed through the Soo Canal since 1855—a billion tons of it since 1935.



## SHIPS OF TWO ERAS

In 1855 the brig "Columbia" (right) carried the first load of iron ore—132 tons piled on its deck—through the waterway. It was loaded in Marquette, Mich., by the Cleveland Iron Mining Company and consigned to Cleveland at a freight rate of \$2.75 per ton. Modern boats carry up to 21,000 tons and average 14,500 tons. In the four war years of 1942-45, more than 466 million tons of ore, coal, limestone and grain took the Soo route. A modern ore boat is shown below leaving Davis Lock. On the left is Sault Ste. Marie, Canada.

PHOTOS FROM "STEELWAYS" PUBLISHED BY AMERICAN IRON & STEEL INSTITUTE



the remainder by rail, the latter deliveries being made largely during the winter season when the lakes are closed to navigation. In 1855, when the canal was put in service, 1447 tons were transported. Prior to that time ore shipments had been carried across a portage at the Soo. The following year the figure rose to 11,597 tons, proving that there was need for the waterway. The million-ton mark was reached in 1875 with a total of 8,062,209. Through the years, the volume of ore passing through the canal has become an index of the relative health of American business and industry.

A 21-foot drop at St. Marys Falls was the natural barrier engineers surmounted in creating the flow of bulk cargo that is the life line of the economy of two nations—Canada and the United States. Canoes could shoot the rapids with considerable risk, and ships like the *William Brewster*, which negotiated them in 1842, have gone down the white water with safety despite a measured velocity of up to 24 miles an hour.

In the seventeenth and eighteenth centuries the fur trade was the principal

commerce of the region. To a canoe fleet, portage did not seem to be too serious an obstacle, but in 1797 the North West Company (which later merged with the Hudson Bay Company) constructed a canal on the Canadian side. It had a single 38x8¾-foot lock that could accommodate its large freight canoes with a capacity of approximately 3 tons of furs. This artificial channel was used until an invasion by American forces during the War of 1812 when, according to some accounts, the works were destroyed.

That primitive eighteenth-century canal in the then far Northwest was evidence of the early need to integrate the world's greatest inland-sea waterway. The discovery of copper and iron in the Superior area in the 1840's made the opening of the St. Marys River to navigation by modern steamers imperative. The first serious engineering approach to the problem was made as a part of the great program of internal improvements upon which Michigan, like other states, embarked during its first year of statehood—1837. Proposing a canal 4560

feet long, J. Almy, civil engineer, reported to Gov. Stevens T. Mason that a survey of the site indicated that no serious difficulties would be encountered.

"Even that portion of the line where rock is indicated will not, owing to its peculiar quality and position, require blasting," he wrote. "Large detached masses of granite, of sufficient magnitude for lock stone," covered the ground along the route, thus saving the cost of "transporting this indispensable article, so necessary for the permanent and durable construction of such works," from remote quarries.

To reduce hydraulic pressure on side walls and gates, Almy proposed to divide the falls, which he calculated to be 18 feet, into three separate locks with a 6-foot lift each. His plan called for a 10-foot-deep channel with sloping sides to give a width of 50 feet at the bottom and 75 feet at the surface in the section to be cut through rock, with the remaining stretch to be 100 feet wide at water level.

Almy's projected waterway was estimated to cost \$112,544.80. An appropriation of \$25,000 had been made for the survey in March 1837, and a Michigan State act of April 5, 1838, provided an equal amount to begin construction. Contractors attempted to start work on May 13, but were driven off by Federal soldiers at Fort Brady when they sought to interfere with the millrace that served the fort's sawmill. Political differences and other factors also blocked progress, though demand for navigation on Lake Superior increased. Steamers and sailing vessels in cradles placed on greased ways were portaged bodily around the falls with the aid of capstans. It took about a month to make the trip. Then a special portage railway, using 2-horse wagons, was built to carry merchandise,

and in 1850 it transported the sizable total of 6000 tons of goods, including copper and bloom iron.

In 1844, Col. J. J. Albert, Bureau of Topographical Engineers, reported to Secretary of War J. M. Porter that he found the Almy survey and cost estimates still acceptable but suggested increasing the capacity of the canal and locks to handle larger steamships. That year the gunboat *Michigan* was launched at Erie, Pa. Of 600 tons burden, she had a length of 167 feet, a beam of 47 feet and a draft of 8 feet. "Freight vessels of these dimensions," stated Colonel Albert, "would draw more water as they are generally more heavily laden." He therefore recommended 200x50-foot locks and a canal 100 feet wide and 12 feet deep.

Colonel Albert proposed building three double locks—one of each set for ascending and one for descending ships. For the channel proper he planned nonsloping sides to be revetted with dry stone walls 3 feet thick at the top and 5 feet at the bottom, with the option of reducing the width where there was a sufficiently firm rock facing. Details appended to his report show that most of the canal excavation was to be in rock with 6 inches to 5 feet of overburden.

Except for the lock dimensions, which were increased to 250x60 feet, Colonel Albert's recommendations were embodied in the Act of Congress of August, 1852, granting Michigan a right of way 400 feet wide through the military reservation and donating 750,000 acres of public lands to the state (these included

the site of the later fabulous Calumet and Hecla copper mine) to pay for the cost of construction.

In 1852, Capt. (later Colonel) August Canfield of the Topographical Corps made a new survey and estimated the cost of construction at \$557,739. In the following year the Michigan Legislature specified 350x70-foot locks and authorized the contractor—St. Mary's Falls Ship Canal Company, a New York corporation with Charles T. Harvey as the engineer in charge—to begin work on the project.

In connection with the continual change in lock dimensions, it is interesting to note that Eber B. Ward, owner of the largest vessels on the Great Lakes in the 1850's, was vigorously opposed to locks more than 260 feet long on the ground that they were unnecessary. At the time that size fully met his requirements, but only a few years later still bigger locks were needed.

Completed in the remarkably short course of a little more than two years, this early canal had the largest locks and gates and the greatest depth of water of any American engineering work extant, and was considered to be "about the first ship canal in the United States" (Alfred Noble, Annual Report, Chief of Engineers, 1877). It was 5694 feet long, 100 feet wide at the surface and 115 feet

at the top of the embankment, which was 5 feet above water level. The slope, calculated at  $\frac{1}{2}$  to 1 and paved where the cut was not in rock, gave it a width of 64 feet at a point 12 feet below the surface and 44 feet at 13 feet. The lock walls were of limestone transported from Marblehead, Ohio, and Malden (now Amherstburg), Ont., while the backing came from nearby Drummond Island. The face stone was dressed with bush-hammers and laid in regular courses.

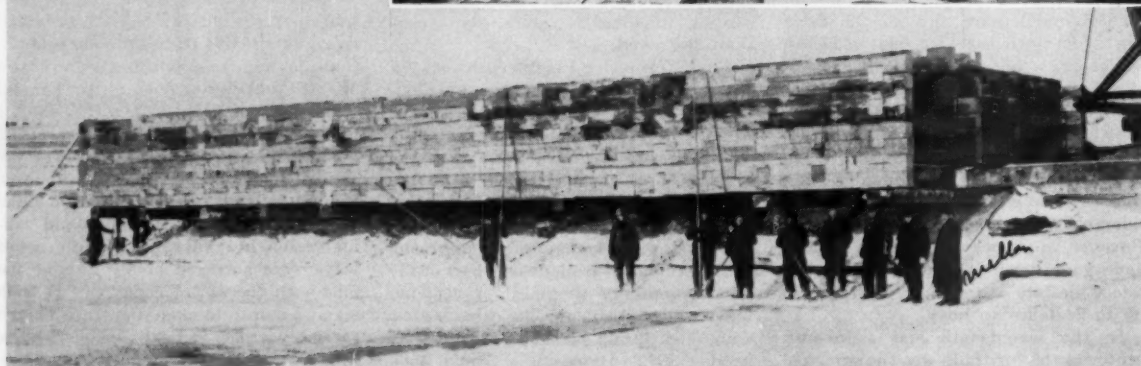
The canal ran in a straight line, except for about 900 feet at the upper (west) end, which had a gentle reversed curve that served the dual purpose of reaching deep water sooner and of keeping floating ice in the river from entering. This section of the waterway had vertical banks formed by wooden cribs filled with stone. Each of its two locks, which were placed adjacent to each other at the lower terminus, was 61½ feet wide at the bottom and 70 feet at the coping. The available depth of water was 11½ feet, with a lift of 9 feet.

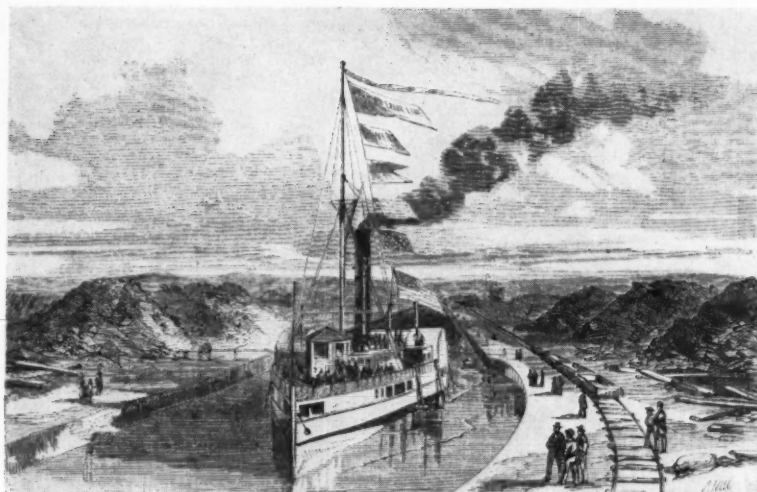
Filling time for the 350-foot locks was seven minutes each, which is about equivalent to that of the present-day 800-foot MacArthur Lock which requires eight to twelve minutes, depending on the valve opening. All gates were of wood of the customary miter-gate design and were supported by a series of

#### CONSTRUCTION SCENES

Floor timbers in the Poe Lock are still held to the underlying rock by bolts that are shown at the right being put in place and tested in 1894. The other view pictures cribbing for the Davis Lock placed during its construction around 1912.

BURTON HISTORICAL COLLECTION PHOTO





### GALA TRIP

A passenger boat of the Lake Superior Line carrying interested sight-seers out of the lower end of the original canal soon after the waterway was opened. Evidence of construction activities may be seen on both sides.

suspension rods which passed over heavy wooden columns and were anchored in the masonry walls. They were operated by a system using a capstan, cable and wooden spar.

When first built, caisson guard gates were placed at the head of the canal and below the locks. The reason therefor, as expressed by Colonel Albert in 1844, was that the level of Lake Superior was found to vary as much as 4 feet through different causes. The upper gate proved unsatisfactory, and a new one of miter form with an intricate opening and closing mechanism was substituted at a point farther upstream. It was never put to the test, but would have proved inadequate in an emergency, according to General Orlando M. Poe, later in charge of the canal.

Construction presented a series of problems aggravated by cholera and other difficulties which have been described elsewhere. Colonel Canfield had started excavating with a system of "swinging derricks" that was found to be wasteful of man power. During 1854 the survey elevations were found to be in error. They had been based upon data obtained when Lake Superior was a foot higher than normal, so the whole bottom from the lake to the locks had to be deepened an additional foot at great extra cost. Two-thirds of this stretch was in rock, and as power drills were not yet available hand drills were used for the tedious job of scraping 12 inches from about 25,000 square yards of surface. While this work was in progress the rough rock sides of the canal were smoothed and given the specified slope (later altered to perpendicular walls).

The big jolt came after the close of navigation in 1854 when a reef beyond

the cofferdam that had been built at the Lake Superior entrance to the canal turned out to be solid rock instead of sand, as indicated on the maps. This reef was about 100x300 feet in extent and from 1 inch to 3 feet in thickness. It was necessary to get this obstruction out of the way by May 19, 1855, in order to save the contract. It took weeks to get a reply to a letter from the directors at Albany, N.Y., and mails stopped altogether during the spring rains.

---

*On the Great Lakes, mariners call a vessel a boat, not a ship, no matter how big it is. Speed is reckoned in miles per hour not in knots, and the sailor who steers the vessel is a wheelman not a quartermaster. Berthing tugs are almost unknown, for lake skippers think nothing of maneuvering their 600- to 700-foot craft unaided in channels which have only a few feet of clearance.*

---

So the contractors were on their own, and as a result invented an exceedingly ingenious machine called a "steam punch." It was made in a blacksmith and carpenter shop on the site (the nearest machine shop was 400 miles away at Detroit) and was a triumph of frontier craftsmanship and engineering. On one occasion all the available forge bellows burned when the shop caught fire, and it was necessary to buy replacements that had to be brought hundreds of miles over the ice from Georgian Bay saw-mills.

Nucleus of the punch was a square bar of steel tapering from 4x4 inches to 1 inch. Rings of increasing size were

welded around the bar and fused into a solid mass 2 feet long and with a maximum diameter of 16 inches at the point farthest from the 1-inch end, which was tempered. Two wrought-iron propeller blades were removed from a steamer in winter quarters. One of these was welded to the butt end of the punch to make a "thimble" flange and the second blade was used to make a thimble to fit inside the former. Then a white oak timber, 14 inches square by 30 feet long, was inserted and a heavy wedge key, introduced into precut key holes, passed through both thimbles to hold the punch firmly against the shaft. Axles from tramcars were bolted onto the four sides of the shaft in precut grooves, giving the rig a total weight of about 3 tons.

The assembly was fitted into a tall pile-driver frame mounted on a scow and connected by ropes and pulleys with the drum of a portable steam engine. The drop was about 15 feet, including the 12-foot channel depth. As a gauge, a mark was placed on the shaft to show when the punch had reached the required level. How the machine operated was described as follows by Harvey half a century later: "Reels were placed on the scow working ropes whose ends were attached to the opposite piers—a turn on the ropes moved the scow 18 inches side ways so that in the space the solid punch must sink to nearly its own diameter in the rock to bring the mark on the shaft to the water level."

The first drop of the punch was a minor disaster. It struck the side of a boulder a glancing blow which broke the shaft at the socket, and the punch had to be fished up from the bottom. Grappling for boulders in the channel was started, and a few more were found and removed. After the shaft was replaced, work was begun on a 3-shift 24-hour basis, rain or shine—except Sunday, which remained a day of rest at all times.

To test the punch, an old Osgood type dredge powered by horses was stationed behind it and brought up several empty scoops. Instructions were then given to draw the boat back to its limit and to apply extra holding power. The dredge creaked and seemed ready to disintegrate, but the scoop turned up a full load of fragmented stone. After it had broken a "face" across the channel, work was easier. Not a single piece of rock was turned up larger than a man's hand, evidence that the punch had successfully shattered the ledge to the desired depth.

The steam punch was inspected by the directors in May and was found to "strike blows of 30 or more tons to the square inch on rock 12 feet below the surface with the utmost precision." It was calculated that its invention, to meet the emergency when the "sandy" reef turned out to be rock, effected a saving in cost of not less than \$250,000. The





PHOTO, JOSEPH KLIMA JR., DETROIT

#### SHIP IN ORIGINAL LOCK

An early steamer in the lower of the two original tandem gates are visible in the right foreground. Lock tenders locks. The rods that supported one half of the wooden lived in the two houses on the left.

old punch was preserved, at least until 1905, at the Sault.

Though well built, the 1855 canal and locks had some defects which were analyzed from an engineering standpoint by General Poe, who was in charge of their replacement. His criticism, written in 1889, shows the lessons learned in design through careful analysis of the performance and construction of the old canal—lessons that were embodied in subsequent projects of this kind and were as follows:

1—The gentle slopes of the sides permitted the bilge of vessels to touch long before the actual bank was reached, thus practically reducing the available waterway to the width of the prism at the bottom. As the slopes were paved with stone, the result when a boat touched was sure to be injurious. With a strong beam wind, it was hard to avoid striking.

2—The curved design at the entrance where there was a strong cross current created difficulties, especially when a tow of two or more vessels—common in those days on the Lakes—was coming down, and it was often necessary to break up the tow, bringing boats in singly. The entrance of floating ice which this curved design was intended to prevent was found to be largely an imaginary hazard.

3—The system of suspending the gates interfered with the handling of heavy lines of vessels going through because they had to be passed clear in each case.

4—Failure to make use of readily available water power to operate the gates was criticized. The system in service called for a large number of men to turn the capstans which opened and closed the gates—a far from efficient arrangement. (Man power was much cheaper in the old days.)

5—The considerable batter of the lock walls increased the cost of their construction and decreased the capacity of the locks. In locking through more than two downbound vessels at a time it was necessary, as a matter of operating

economy, to place two or even more side by side (the dimensions of boats of that day made that possible). But if the combined beam of the vessels was nearly equal to the width of the lock at the surface they tended to jam together as the water level dropped.

The Federal Government took over the Soo Canal in 1881. The first single lock, the Weitzel, was built in 1876-81. It had a capacity of 515x80 feet and a depth of 17 feet. Its use was discontinued in 1918, and it was replaced by the MacArthur Lock during World War II

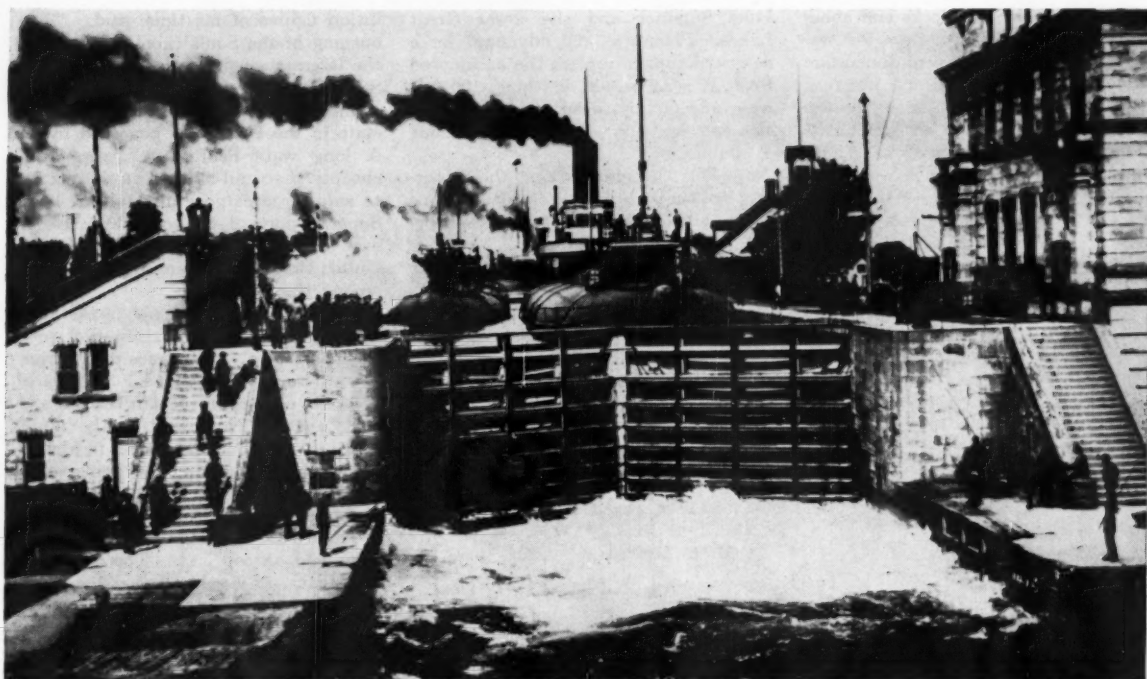
#### YOUNG SCALE SALESMAN LED ORIGINAL CONTRACTOR

THE original St. Marys Falls Canal was built by the State of Michigan because the National Congress could not see the need for it. Three bills to authorize it were defeated in Washington, and during the debate on one of them, in 1843, Henry Clay protested that "it contemplates a work beyond the remotest settlement in the United States, if not the moon." Finally, nine years later, after rich and extensive deposits of iron and copper ores had been discovered in the Lake Superior region, Congress granted Michigan 750,000 acres of land in the upper peninsula with which to pay prospective contractors for constructing a canal.

When the news of this grant reached

the site, Charles T. Harvey, 24-year-old western agent for E. & T. Fairbanks & Company, scale manufacturer of Johnsbury, Vt., happened to be there recuperating from an illness. Already optimistic about the economic prospects of the area, he succeeded in imparting some of his enthusiasm to his employers, with the result that the firm persuaded several other concerns and some individuals to join it in forming a syndicate to bid on the work. The group got the contract and, as director of the project, young Harvey bought supplies, recruited a foreman and 400 laborers in Detroit and set sail for the Soo in the chartered steamer *Illinois*.

Later as many as 1600 men were em-



"STEELWAYS" PHOTO

#### LOCKING THROUGH AROUND 1900

Two smoky coal-burning "whalebacks," once the pride of the ore fleet, waiting around the beginning of the century to be lowered to the St. Marys River. Details of the lock gates and their anchorages are in plain view.

to expedite the flow of iron ore to steel mills. After the Weitzel had been in service for only three months a larger unit—the Poe Lock—was proposed. This entailed the removal of the original Michigan locks. Old plans disclosed some interesting details about their construction and site conditions which set the basic pattern for subsequent improvements.

Work done in 1888 to deepen the canal for about 700 feet involved drilling and blasting approximately 2000 holes through "a formation of Potsdam lime-

stone arranged in soft red and hard white strata, with occasional thin layers of clay, all in unknown proportions." The holes were spaced about 5 feet apart, varied in depth from 3 to 7½ feet (average 6¼ feet) and had to be large enough to take cartridges 1¾ inches in diameter. The bottom row nearest each canal pier was at a grade 97 feet above canal datum, the others at 93 feet. It was specified that each hole for each foot of depth should be charged with ¾ pound of Hercules No. 2 powder, or its equivalent, exploded at full depth, and

as the Government had on hand more than a ton of Aetna No. 2 powder and 1000 fuses that stock was used first. Work on the Poe Lock pit was started the following year and necessitated:

1—Excavating and removing 108,000 cubic yards of sandstone and 131,000 yards of overlying material, as well as 11,600 yards of old lock masonry, 137,000 cubic feet of lock timbers and six lock gates.

2—Filling in the site for a new pier in front of what was then Fort Brady with 100,000 yards of material taken from the lock pit—the first 25 feet back of the pier with rock and the remainder with any excavated material except timber—and leveling the entire surface back to a bluff on the shore for an average width of 100 yards.

3—Laying an estimated 5000 yards of face or other valuable stone in the old lock wall on the north bank of the canal, as directed by the engineer in charge.

The contractor was required to leave the rock in the bottom of the pit undisturbed but to dress it as needed to receive the timbers and masonry of the lock. Construction therefore called for careful drilling and blasting, for any shattered rock had to be removed and replaced by him with masonry or concrete at his own expense. The pit, including end slopes, was about 1200 feet long and 170 to 250 feet wide. The work was completed in 1896.

The axis of the Poe Lock was parallel

ployed. All the rock was drilled by hand, some of it in minus 35-degree weather. All dirt and broken rock was hand-shoveled into wheelbarrows and trundled away. In 1854 an epidemic of cholera caused the deaths of one worker in every ten, but more were hired and the job went on to completion.

Robert H. Morse, Jr., president of Fairbanks, Morse & Company, has been named by President Eisenhower as a member of the 9-person Federal Commission of the Soo Locks Centennial observance during the coming summer. It was his grandfather who, as head of the predecessor firm, united with Thaddeus Fairbanks, inventor of the scales, to enlist the support of the eastern financiers who joined in the contracting venture.

The Soo Locks Centennial observance will take the form of an exposition of science, industry and education. It will begin a 72-day run on June 28. A feature presentation that will be repeated many times will be "The Soo Centurama," an outdoor theatrical production with a cast of 350 that will portray the history of the two neighboring communities of Sault Ste. Marie and the Soo Locks. It will be produced by professionals and will be climaxed each night by a display of fireworks.

The exposition is being promoted by the American and Canadian cities on either side of the locks, the State of Michigan, the Province of Ontario and various interested departments of the United States Government.

to that of the old 1855 locks and about 45 feet east. A decade ago the Poe was slightly modified. Its present dimensions and depth are 704x95 feet and 16.6 feet, respectively. It is the oldest of the five parallel locks—including one in Canada—which constitute the St. Marys Falls canal system. The locks are in tandem, not series, and each vessel passes through only one as it makes its way between

Lake Superior and the lower Great Lakes. Plans are well advanced for a new structure to replace the antiquated Poe. It is to be 800 feet long, 100 feet wide and 32 feet deep and to be constructed as soon as funds are made available.

In 1905, in summarizing the importance of the waterway, Peter White, one of the greatest industrial and transpor-

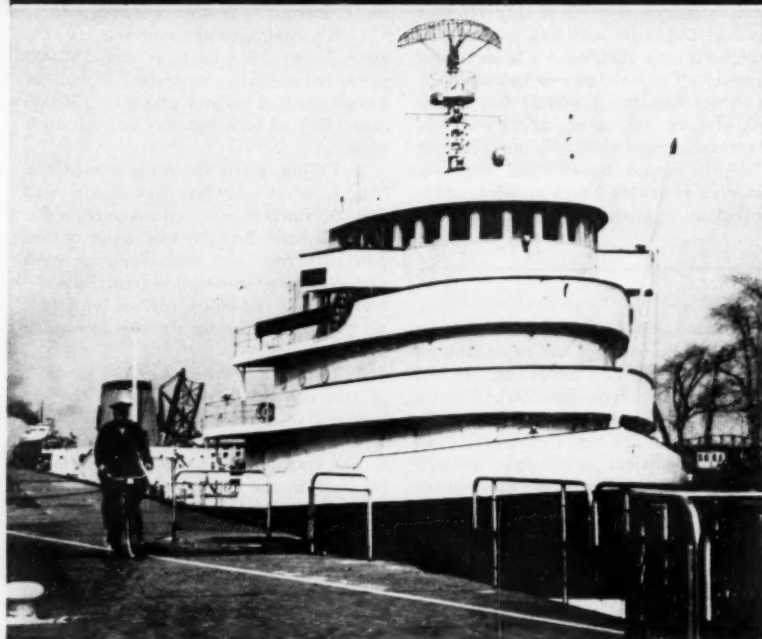
tation figures of his time, said: "The opening of the Sault canal has been of the largest benefit to the whole United States of any single happening in its commercial or industrial history. Every state in the Union has benefited by it. A long water-haul is so enormously cheaper than rail-haul, that the ability to ship large cargoes direct from Lake Superior ports, 1,200 to 1,500 miles, or even across the seas, has transformed the United States and changed her position among the nations.

"The grain of the northwest now finds an eastern or foreign market with surprising ease. Flour goes direct from Duluth to Liverpool . . . Millions of acres are now under plow in Dakota and the Canadian Northwest as the result of the canal. Bread is cheaper in Massachusetts . . . Without this transport it would be impossible that the American people could be so comfortably housed, or that American timber could have been sold abroad . . . The copper of Michigan . . . is sold all over the world . . . The age of electricity is due to the canal. Before this movement began the iron industry of America, chiefly engaged with the lean Pennsylvania ores, was having a fierce struggle for existence . . . The canal made Pittsburgh the great city that it is today."

Iron ore is the most dramatic example of the significance of the canal. Today, 85 percent of the iron ore produced in the country passes through it, according to the Corps of Engineers, U. S. Army. A study of pig-iron output shows that Great Britain steadily produced from four to six times more than the United States in the quarter century prior to 1855 when our total annual output was about 600,000 tons. A decade later, when Soo boats transported the Superior ores the 1000 miles to the site of the existing steel industry and its essential coal supply in Pennsylvania, the figure had doubled. By 1890, with a still larger waterway system available, our production exceeded Britain's for the first time.

Lumber, even from the Pacific Northwest, was once a great factor in the canal trade but has nearly disappeared. So, too, has copper, because the cost of mining this high-quality ore has reduced output except in periods of emergency. Before the recent opening of a new pipe line large quantities of oil were also shipped. Now iron ore and grain come down, while coal is the principal cargo for upbound vessels.

In 1953 a total of 26,122 vessels carrying 110,076 passengers and 128,510,232 tons (net) of freight passed through the Soo Canal, the all-time high in its history. In its prime function of joining the great economic regions of the country, "The Billion Dollar Mile," as the waterway is also called, is truly the heart of American economy.



"STEELWAYS" PHOTOS

#### CHECKING BOATS

Today the chief lockmaster (top) directs vessels in the lock area by ship-to-shore telephone. The other picture shows a lockmaster who uses a bicycle to check the draft of a downbound ore carrier forward, amidship and aft.



How leaky lines  
are repaired by

## Clamping Gas Mains

Richard C. Castner

**A**IR-POWERED tools fit into utility operations for the same basic reasons they apply to industrial, mining, railroad and contracting operations, namely: light weight, adaptability, power, ruggedness, portability, safety and dependability. Public utilities that are in the business of distributing natural gas are one of the major users of air power. In their everyday operations, crews that put in new mains and services, replace and repair old ones, and install industrial as well as domestic gas facilities utilize pneumatic tools and air compressors to do their work more efficiently.

The fundamental tools of a utility crew are the paving breaker, the clay spade, the backfill tamper and the rock drill, plus accessories, the number and size being dictated by local conditions. And when occasion calls for it, these tools may be supplemented by sump pumps, chipping hammers, grinders, earth augers, sandblast units, paint-spray guns, hoists, drills, saws, impact wrenches and many other of the hun-

dreds of air-powered tools now available.

Utilities perform many routine jobs every day to bring better, more economical and safer service to their consumers, and in nearly every one of them air power plays a big part. As an example, let's look at only one of the many operations that go on daily in the gas-utility field. Gas leaks in mains and service piping must be guarded against continually. The success of the utilities in controlling leakage is attested to by an almost perfect safety record, which has helped natural gas gain wide acceptance as a source of heat energy.

One of the major sources of leakage are the joints of the cast-iron distribution mains. The condition of the joints is checked periodically by testing the surrounding soil for the presence of gas. This is done by drilling holes, usually

with air-powered equipment, through the pavement and earth covering the pipes and by sampling the air at the bottom with a test meter. Such periodical testing is regular procedure with most gas utilities. When either these checks or any reported condition indicates that a main is leaking, the joints are generally uncovered, cleaned and reconditioned, and a clamp is applied that will give the joint a perfect seal and eliminate any hazard that might exist.

Whenever you see utility crews or contractors cutting holes in a street at intervals of around 12 feet, you can be reasonably sure that they are applying new clamps to a cast-iron gas main. The backbone of the clamping crew is the inevitable compressor, together with the air tools which make this an efficient operation. A good gang, under average



### SCENE OF WORK

General view of a typical clamping job that proceeded along a residential street in a Michigan city for about 2 miles.

### TYPES OF COMPRESSORS

On the job where the accompanying operational pictures were taken the trailer-mounted Gyro-Flo portable compressor shown below furnished the air power. The same company also uses truck-mounted machines of the same type (right). Note that all controls are conveniently located on the truck side.



## SEQUENCE OF OPERATIONS...



**1** Removing concrete with a hard-hitting paving breaker. Here the concrete-and-asphalt pavement was 34 inches thick.



**2** A pneumatic spade served after pavement removal. With it, one man can loosen as much earth as 10 men with shovels.



**3** The bell joint to be cleaned is exposed. Rust, scale and irregularities must be removed before clamps are put on.

conditions, will install at least one clamp per man per day. Some crews have even doubled this rate.

On an extensive clamping job, each detail is organized so that the work will proceed as smoothly as possible and with a minimum of interference to the public. The leader of the crew marks the pavement that must be removed over each joint. Then the concrete surface is usually either scored with a diamond-blade saw or the opening to be dug is outlined with holes by a rock drill, often using tungsten carbide-insert bits. The latter method is usually preferred because it is not only less expensive but facilitates breaking out the concrete.

Next the concrete and/or asphalt surface is removed with a paving breaker equipped with either a 3-inch chisel bit or a 5-inch asphalt cutter, and the hole is excavated with a clay digger using a 5½-inch spade or 3x5-inch chisel. In some instances, a trenching machine can save excavating time. The hole is made only large enough to provide access to the joint and adequate working space; no unnecessary material is removed. For 12-inch pipe a 3-foot-square hole is usually adequate.

When the joint is exposed, it must be thoroughly cleaned and reconditioned to insure a tight seal when the clamp is applied. The state of the pipe varies considerably with local conditions. Cast iron has proved to be extremely durable for underground service; one eastern city has gas mains that have been in continuous use for more than 125 years and are still in excellent condition. Of the many enemies of cast-iron pipe, plain

rust is generally the most serious; the joint is usually covered with a hard scale and pitted with rust.

Cleaning of the joint is done by any of several methods, but nearly always in two steps. First, all accumulations of scale are usually removed by means of chipping or scaling hammers, heavy slow-speed grinders, or portable sand-blast units. The second step, which gives the surface of the joint an even and smooth finish, is nearly always carried

out with a small-size high-speed grinder.

The joint is now ready for the clamp, which is installed in a matter of minutes by merely fitting it carefully around the pipe and tightening several bolts. This is often done with an impact wrench, which reduces installation time and applies a uniform torque on each bolt. The clamp itself is simple in design. Generally, it consists of two segmented iron rings which fit around the pipe on each side of the joint. The rings are bolted to



**4** An air-powered hammer was used to remove scale. This piece of gas main, although buried since 1910, was found to be in excellent condition.



**5** Final cleaning was done by sand-blasting. Air-operated grinders also are frequently used for this purpose.



**6** The sandblaster, working in close quarters, is protected from the flying abrasive by a helmet and obtains breathing air from the same compressor that supplies the gun.



**7** Parts of a new clamp prior to being assembled and installed. The sealing ring is in the center and is surrounded by the rings that hold it tight against the joint.



**8** Here the clamp is shown in place and being given a final check for tightness by applying a torque wrench to each nut that has been run down on the retaining bolts.

each other and, when tightened, force a heavy rubber collar into the joint, providing a dependable seal.

Application of the clamp is followed by backfilling the hole. In some localities this is done with sand, in others with the earth that was removed. A backfill tamper equipped with either a 3-, 6-, or 7-inch round tamping butt is used to compact the material returned to the hole, and 100 percent compaction is desired to eliminate any possible settling of the pavement over the main. New concrete and/or asphalt is then laid, and the clamped main is ready silently and safely to transport natural gas to industrial plants, business houses and residences for many years to come.

Clamping a gas main is not an inexpensive job, but air tools have cut its cost to a small fraction of what it would be without them. The beauty of air power on work of this kind is that the same compressor and pneumatic tools are used every day of the year by the same utility for many other jobs of equal importance.

For our example we picked just one job, which involved cast-iron piping. Today, a goodly percentage of the new gas mains being installed are made of either welded steel or plastic, but of all the mains now in the ground the greater majority are cast iron. We will probably be served well by them for 100 years more, and because leakage will undoubtedly always be a problem, it will have to be controlled and prevented.

Some utilities are experimenting with a new method of sealing joints that considerably reduces the cost of leak prevention as well as the number of holes

required to gain access to the mains. Instead of clamping the joint, a substance is sprayed with air onto the inside surface of the pipe, sealing leaks in the process. At the present time no one can say definitely whether the method will be satisfactory—whether it will endure over the years or will be a limited-time preventive measure only.

Public utilities have been using air power for many years. They have applied standard tools to their work and have been instrumental in the development of many new ones. To operate them they utilize three basic types of air compressors: standard trailer-mounted machines, similar units mounted on crew trucks, and others driven by power take-off. The trend today seems to be towards truck-mounted machines which are independent of the truck-engine, such as the Ingersoll-Rand Model GRU-125. This is a rotary-type compressor, complete with its own engine, and is well suited for utility requirements.

Truck mounting eliminates the inconvenient trailer towed by a crew truck and also the necessity of complying with the increasing restrictions imposed on towed vehicles by governmental groups. Skid mounts cost approximately the same as power take-off units installed, weigh about the same, occupy little if any more space and yet are completely independent of the trucks, operating much more efficiently and calling for much less maintenance. Compressor development is guided to a certain extent by utility's needs, which call for compact, efficient, lightweight and, most of all, dependable machines.

Air power in the hands of present-day

gas-distribution companies is an adaptable tool, meeting their power requirements in a way no other source of power can match. Twenty-four hours a day, every day of the year, the utilities that supply our country with gas have crews alerted to meet any situation that could conceivably arise. Their power is the same that moves mountains, drives tunnels through rock, and makes the assembly lines roll — compressed air.



**9** The hole is backfilled with sand, which is carefully tamped with an air-powered backfill tamper. As this job was done in winter, a temporary patch was applied to serve until new concrete can be poured sometime this spring.



# MINING-CAMP MEMORIES

A Veteran of the West Vividly Recalls  
Daily Life in a One-mine Wyoming  
Settlement 68 Years Ago

ATHA ALBERT RICHIE

Drawings by Andrew Svachak



IN THE fall of 1887 my folks moved from the little farming town of Loveland, Colo., to a one-mine camp in southeastern Wyoming. I was but seven years old, but even now it seems to me as I look back that it was the most antiquated, desolate, isolated place that I have ever been in.

Everything about the camp looked old and worn out. There was a cookhouse, a bunkhouse, a shafthouse over the mine, and a 10-stamp mill that was even then probably as outmoded as anything of its kind anywhere. The roofs of the buildings were all of split shakes (shingles), but I have no recollection of complaints about their leaking though they sagged in the middle and must have been in existence for many years to have attained their aged appearance.

The mine site was in very heavy lodgepole pine timber, and with all the overburden and pine needles on the ground I wonder how in the world the little vein was ever discovered in the first place. The hoist was operated by a steam engine, and while it had two drums they were not on the same shafting and counterbalance. One drum was about a foot smaller in diameter than the other,

which was in back of it. It must have been a very complicated and difficult piece of machinery to run. There were but two cylinders and some kind of a clutch arrangement so that power could be transferred from one drum to the other.

There were two pumps, and I well remember that when "the big pump" was operating the hoist could not be run because the little upright boiler could not furnish enough steam for both at the same time. The mine was supposed to be 200 feet deep, plus a 10-foot water sump. The larger pump had to be operated about an hour each shift.

The mill was also powered by steam but had a locomotive-type boiler. There were no automatic feeders, but the batteries of stamps were open in back and two men shoveled the ore by hand, each working twelve hours daily. They said they could mill 1000 pounds of ore per stamp per day, so each man in the course of his 12-hour shift shoveled 2½ tons.

There was room enough behind the batteries for probably 15 or 20 tons of ore, but I was back there dozens of times and I don't believe they ever had 5 tons ahead of the mill. My brother and I

## A MILL THAT RUNS NO MORE

This picture of the abandoned stamp mill was taken by the author about ten years ago. The first 10-stamp mill, operated by steam, closed down in 1888. It was enlarged to 20 stamps in 1890 and converted to water power. Mine and mill ran for a short time again, but couldn't be made to pay. In the early days, the post office was Keystone; now it is Holmes. The stream, Douglas Creek, had only suckers in it until 1899 when the author's father stocked it with trout. It became a fine fishing stream and summer cottages now stand along its banks.

were the only boys in the camp proper, though there were four or five down the creek a mile or so, and we went in and out of the mill when we wished—no one ever told us not to.

One of the outstanding things that comes to mind after all these 68 years is the pack train that arrived about every five or six days loaded with elk meat for the mine. There was no other meat than elk and deer, with an occasional bighorn sheep and bear. There were two hunters—"Peter the Hermit," more frequently called "Dirty Pete," and his partner the "Long Haired Kid." It was said that the Kid had never had a haircut or a shave. Pete, a Civil War veteran, had a beard



"... the pack train arrived about every five or six days loaded with elk meat for the mine... There were two hunters—"Peter the Hermit"... and his partner, the 'Long Haired Kid.'"

but did have his hair cut occasionally.

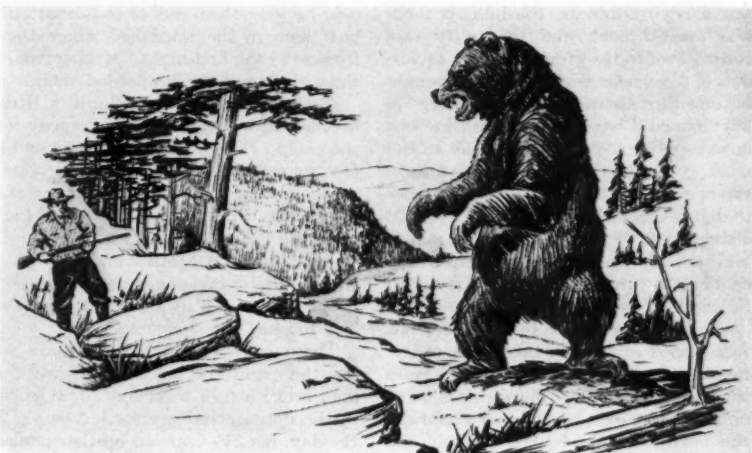
As I remember the Kid he was probably about 32 years old. He had auburn hair approximately 18 inches long and tied behind with a piece of ordinary twine. He never seemed to be the least self-conscious about it. I heard one fellow ask him why he never had his hair cut, and he said that if God intended he should have short hair he would have made him short-haired.

Between the two they had seven jackasses and an old sorrel horse, and I recollect my father calling me and my brother to see the pack train come in. Two of the larger jackasses carried half an elk each, the others but a quarter, all with the skin on. When the cook had used up a quarter he brought in another, skinned it and threw the hide down a bluff just below the boarding house.

Some time that fall Peter the Hermit came in with a piece of bear meat. It was from, as he said, a genuine silver-tip grizzly. Pete had two huge dogs—Queenie and her offspring Ringo. They were just alike, except that Queenie was bigger. I can remember two miners making a bet that she weighed 100 pounds; she weighed 104. As Pete told the story, the dogs "routed" the bear. There was always one in front of him and the other behind. Whenever the bear took a swipe at Queenie, Ringo grabbed him by a hamstring. The creature was really mad and once knocked Queenie "head over tincup," but she got right up and kept on fighting. Pete said the dogs never would have been able to kill the grizzly even if they had cut a tendon and made him helpless, so he walked to within about 30 feet of the animal and shot him through the neck.

The cook at the boarding house asked my mother to come over and see the piecrust he had baked with bear fat. He claimed it made better piecrust and doughnuts than any other grease. He gave Mother some, and to this day it seems to me the best doughnuts I have ever eaten were those fried in that bear fat. I saw the skin of the grizzly afterwards, and it was as large as an ordinary beef hide. Pete tanned it and had it for a bed cover for years afterwards. He said it was better'n a buffalo hide. All the meat was stored in a wide-mouthed tunnel just out from the cookhouse door. I believe it went in about 50 feet and had a raise to the surface at the far end. The cook said the meat would keep there "forever."

Another bear story concerns James (Jim) McCreary who had hunted for the market and sold his meat in Leadville. He came to the camp and went to work in the mine. When on the night shift he frequently took his old Model 1876 Winchester along and occasionally brought in a deer. One afternoon when he was out hunting he flushed a bunch of blue grouse on which he used up all save one



"... and the bear got up on his hind legs and was looking for a fight."

of his six or eight cartridges. Shortly afterwards he ran onto a black bear. He wasn't very large. Anyway, he wounded him badly with a shot in the shoulder so he had the use of but three legs. Jim walked up to the beast, which reared looking for a fight. Picking up some rocks about the size of baseballs, McCreary succeeded in hitting the animal right on the end of the nose. After that he had no trouble driving him toward the camp.

At a point about three-eighths of a mile out there was a bridge over a small creek, and try as he would Jim couldn't make the bear cross that bridge. So he went back to camp, got a few more cartridges and took three men along with him. They found the animal lying on the ground about 50 yards up the trail, and as he was near death finished him up. Then a pole about 10 feet long was cut, and with two men at each end they came carrying the bear in. My brother and I followed them over to the meathouse or tunnel and watched them skin him and hang him up. With his pelt off he looked like a solid lump of fat. Later McCreary sent a piece of the loin over to the house. Mother cooked it as she would have elk or deer but none of us would eat it because we didn't like bear meat.

Two brothers came into the camp that fall with a wagonload of elk and deer and Dad bought one of each and hung the animals up in the woodshed for our winter's supply of meat. Everybody there approached winter with the expectancy of being snowed in for the season, so the mine stored enough "grub" in the commissary and elk and deer meat—mostly elk—in the tunnel to feed the crew.

The company had 125 cords of wood stacked up at the shafthouse for the boiler and another pile of the same size at the mill. My father owned a good team and hauled the wood to the mine

and another teamster brought it to the mill. Around the middle of November Dad took the horses and wagon out to a cow ranch in the valley and turned the animals out until spring.

As a usual thing the roads were impassable by the middle of November, but that winter the ground was still bare at Christmastime. Before long, however, the snow really did come down, and by the end of January it was said to be 6 feet deep anyplace one wanted to measure it.

The miners had built an entertainment hall with a billiard table in it, and on Christmas Eve everybody assembled there, the women dressed in their best and the men neat and clean in overalls, for I doubt if there was a man in the place who had a suit of clothes. In one corner of the hall stood a red-hot stove and in another they had set up a pretty balsam tree with about fifteen or twenty miner's candles wired to the branches.

There was a considerable group of Cousin Jacks in the camp, and four of them with big walrus moustaches got up and sang carols. To this day I wish I could make carols ring like those did that night. About the time the singing was finished there was a terrific noise at one of the hall's half windows, and when the mine foreman opened it Santa Claus stuck his head in and asked if a party was in progress there. He said he had received word from George Steel, who was to have been Santa Claus, that he got stuck coming over the Snowy Range. (Any reader who doesn't know where the Snowy Range is let him get a map and look about 50 miles west of Laramie. There he will find Medicine Bow Peak, 12,000 feet high, right on top of the Snowy Range. I have been in seven of the national parks, and to me the Snowy Range is the most scenic of them all.)

After the presents had been distributed the candles were put out, the tree

was carried outdoors, the billiard table was pushed back and the party was turned over to the grownups for a square dance, though there were but five women in the entire district who could dance. A boy named Charlie, I am sure he was not more than eleven years old at the most, got up on the table with his father, the one to play the fiddle and the other to do the calling. Charlie could not read a single note of music, but it was said of him and of two of his sisters that they could play anything after they had heard it three or four times.

While the dance was in progress a hat was passed around to take up a collection for Charlie. He got something more than six dollars for his services as a musician; enough, my mother remarked the next morning, to buy himself and his brother needed shoes. But my dad said you will see him and Chub at the store the first thing in the morning and each will be going home with a pound of Climax tobacco in his hand. Dad was right.

What did the people eat during the time they were snowed in? Well, in addition to the meat, of which there was always an abundance, the boarding house had a few sacks of turnips, carrots and cabbages and plenty of potatoes in the roothouse. The cook had dried fruit for pies, and he made pies of crackers. The crackers were not salted as they are today, and he would soak them in water flavored with lemon sour. I have not seen a bottle of it since. I believe it was concentrated lemon juice. Anyway it was the sourest stuff I ever tasted.

My mother baked pies of dried apples, peaches, currants and pears and also made a filling using a spoonful of cider vinegar instead of lemon juice. We all liked her vinegar pies. Dad brought in two cases of eggs, 60 dozen, and when they began to show slight signs of stale-

ness he took them out of the cellar and put them in the woodshed where they froze solid the first night. Mother would thaw them out as she needed them.

Along in the winter Charlie's little brother died. It was quite a tragedy for the camp. One of the miners who had a few carpenter tools got some boards and made a very presentable coffin for the little fellow who, I think, was about four years old. They brought the coffin over to our house and Mother lined it with a sheet. Well I remember how she nailed it in so that not a tack showed when she had finished.

There was a small burying ground below the camp and up on a hill and the men broke a trail to it and dug a grave in the decomposed granite. A week to the day, his 2½-year-old brother passed away, so the miner with the carpenter tools made another coffin and Mother cut up another sheet and the men loaded the coffin on a ski hand sled and took it to the cemetery on the hillside. There were several nice open parks along the creek, and I have often wondered why the cemetery was started back in the tall timber where it was so hard to dig a grave.

On his last trip out to the ranch country that fall my father brought back two little red Jersey pigs that weighed, I suppose, 10 or 12 pounds each. He made arrangements with the boarding-house cook for the refuse from the table to feed the pigs, and it was the job of my brother and myself to go over twice a day and get the stuff. He had fixed up a stick with a snap in the middle so it wouldn't be too hard for us to carry. Naturally, we got well acquainted with the cook, who was always nice to us boys. One day we saw him cutting up the shank bones of an elk and he told us he was making "son of a - - -," as most mining men called stew. He said,

"They can't have steak all the time and I'll put lots of 'Cheyenne pepper and Winchester sauce' (Cayenne pepper and Worcestershire sauce) in it and they will gobble it up."

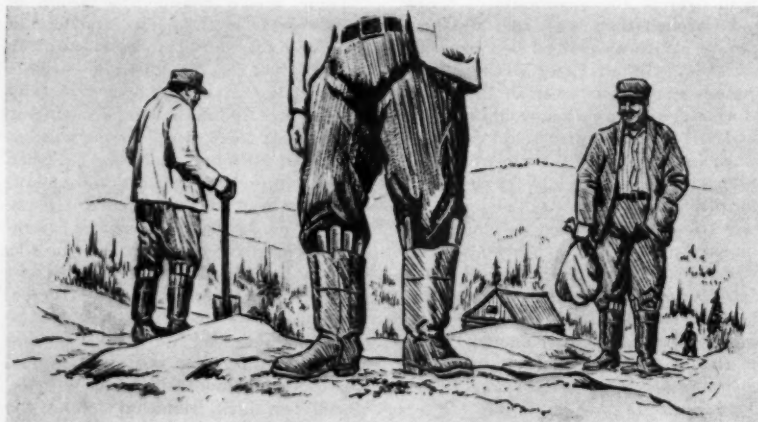
During the winter the cook wanted to visit his son in Omaha for a couple of weeks because he hadn't had a day off in more than a year. He came over to the house and asked Mother if she would take his place while he was gone, but she told him she couldn't get meals for four children at home and do the cooking for the boarding house. But she did take the job when she learned that he had spoken to Jack Martin the super and arranged for us kids to eat with the men.

She and Dad had to get up at four in the morning and walk about 300 yards to the cookhouse, start fires and have the men at work by seven o'clock. Dad cut up the meat and we two boys set the tables for her. It certainly was a big job for Mother, for besides getting the meals she had to bake bread every day, and three or four times during the time she was there she had to roast coffee, which came in 150- to 200-pound sacks and was green.

Tea arrived in boxes, about 18 inches square, covered with cream-colored paper with Chinese lettering all over it. They were fastened with wire, not nailed together, and inside each one was a hermetically sealed box made of lead which, I think, was 1/64 inch thick. The tea was in separate packages of 5 pounds each. Before leaving, the cook informed Mother that "Dirty Pete" would ask her for the lead to melt and make bullets. He did, and at the time told her she was a very good-looking woman for a mule skinner's wife.

The men in the camp were good to us. One of the mill engineers went out in the woods and felled a green tree about a foot or less in diameter, hewed it off on four sides and then took an ordinary rip saw and cut a couple of boards about 1½ inch thick and made my brother a pair of skis, which we called snowshoes. There were no Canadian snowshoes of woven rawhide in the place. After he finished those he made me a pair. He must have worked a couple of weeks on them. When I first tried mine I got them crossed in front and then behind, and I sure had a heck of a time with them, but it doesn't take a kid long to become expert at skating and skiing, and in a couple of weeks I was coming down the hillside at a mile a minute and dodging trees on both sides.

As the ritual in the Odd Fellows work says, "Spring came and the soft zephyrs played among the branches and they budded forth again," so spring finally arrived. Around the middle of May small streamlets started running along the top of the hard-packed snow on the trails. Soon a patch of bare ground appeared between the shafthouse and the



"All the miners wore boots. When they went down into the mine, each carried along his daily supply of giant blasting powder . . . stuck into the tops of his boots . . . together with two candles to last him through the working hours."





"There was a considerable group of Cousin Jacks in the camp, and four of them with big walrus mustaches got up and sang carols."

bunkhouse, and as the men came out of the mine I believe every mother's son of them got on the spot and tramped around in the mud. One of them, Louis B. Rhodes, about whom Josiah Edward Spurr wrote in *Mining Journal* some 45 to 50 years ago and whose cabin in the Klondike he had shared, got down and rolled over in it two or three times, kicking up his heels. A Cousin Jack shouted, "Some beauty I call it."

The creek thawed and became a real river with full-length trees floating down. All the inhabitants watched them pass by, and everybody expected to see the bridge between the mine and the family dwellings go out. But it just so happened that all the trees lay flat as they went under the bridge, so it remained intact. With the spring came hordes of mosquitoes, flies and gnats. They almost ate us up. No one had screen doors. Anyway, the gnats would have gone right through them if we had had them. There were three different varieties of biting flies of which the deer fly, of almost perfect equiangular shape and with spotted wings, was the worst. If two or three of them bit one on the hand it would swell up as bad as a bee sting.

After my father sent his horses out he went to work in the mine as a shaftman. But during the winter one of the hoistmen decided that he had been snowed in long enough and went to the foreman and told him he was quitting. When asked where in the world a new hoistman was to come from at that time of the year, he volunteered to break in a new man. There were two workers at the mine who had known my father in Colorado where he had fired on a railroad for a short time. They told the foreman that Charlie Richie could run that hoist if he was given a chance to get acquainted with its mechanism. So Dad took the job and stayed on it until the mine closed down.

The cylinders of the hoist were lubricated with tallow because oil lubricators did not come into use, I believe, until some time later. At any rate, I do know that locomotive engineers were known as "tallow pots," and the three engineers at the mine, as well as my Dad, were all called "tallow pots." There was a supply of four or five barrels of tallow at the mine. It was as hard as heck and had to be dug out with a spade. It was put in a pot with a steam pipe running through it, and somehow or other got into the cylinders. When hot enough to flow, it really smelled to heaven, and the exhaust from the engines, both at the mine and the mill, smelled just like the tallow. As Sir John Falstaff said in *The Merry Wives of Windsor*, "the rankest compound of a villainous smell."

One time, as Dad was digging tallow out of a barrel, he called my attention to what was printed on it. I read, "Dodge City Rendering Works, Buffalo Tallow." I was back on the creek fishing in 1912, and when I went into the mill I found several barrels of the stuff still standing there. Recently my daughter gave me a book which tells about the Kansas rendering works, which shipped tallow all over the United States to lubricate cylinders and locomotives.

All the miners wore boots; I don't believe there was a man in the camp who owned a pair of shoes. When they went down into the mine each carried along his daily supply of giant blasting powder—sticks of dynamite. These he stuck into the tops of his boots, three on each side, or twelve in all, together with two candles to last him through the working hours.

Around the first of June the first team came in, and what rejoicing to know that one could get to the outside world again. A Mr. Downey of Laramie was owner of the mine and putting up

the money for its operation. He was an outstanding attorney in Laramie. One of his sons was elected county attorney and afterwards mayor of Laramie; another son also became county attorney and subsequently United States Senator from California. Still another is now a prominent attorney in Sacramento. With the first team Mr. Downey sent in a box of California oranges, a box of cigars for the men, and two cases of eggs and other things which had not been seen for months. And how those hardrock miners and the women appreciated the "luxuries."

One morning before Dad went to work he gave me and my brother orders to go down along the creek and gather a water bucket full of cowslips for greens, together with some watercress. He instructed us to "mash them down good in the bucket as they will cook down to about a fourth of what you get." Later on we picked a variety of wild berries—strawberries, raspberries and several kinds of currants. My mother was surely after them while they were to be had. Oh, yes, there were also little red huckleberries.

One of the men tanned a couple of deerskins and Mother saw him at it so she asked about how it was done and immediately got three hides and started us boys and Dad at tanning them. She had us dig a trench about 12 feet long, cover it, and put a barrel over one end and a fireplace at the other. After the hides were tanned she hung them in the barrel and built a fire in the fireplace to smoke them, burning green willow leaves that gave the buckskin a delicious odor as long as it lasted. Out of the leather Mother made us the best mittens I have ever seen. She lined them with material cut from a U. S. Government blanket and attached the wristers she had knitted. She also patched the knees and seats of our overalls with it, and when our shoes ripped she sewed them together again with buckskin.

I remember some of the men saying, "Well, Mr. Downey made \$600 last clean up"; and then the next one he lost \$500. Anyway, in the fall of 1888 he decided that it was not a paying business and closed the mine down and Dad took us kids to Laramie so we could go to school.

Today a post office called Holmes is at the old mining camp, which was named Keystone when I lived there as a youngster, and the Union Pacific Railroad cuts millions of ties along Douglas Creek. There were only little black suckers in it in the early days, but now it is one of the finest trout streams I have ever whipped. Dozens of cabins have been built on its banks and are occupied during the fishing season. A car can make the trip from Laramie to the place or the Snowy Range in an hour, and hundreds of deer are still killed along the creek every year.



## Cosmetics in Push-Button Bottles

SOME liquid cosmetics are now available in self-dispensing glass pressure packages that one distributor calls "the hottest idea since someone thought of putting out lip rouge in stick form." When aerosols or pressure packs first became prominent, great hopes were entertained in the cosmetic industry that the perfect package had been found for perfumes and similar liquids. Some were, in fact, put up that way in cans, but the method was soon found to be far from ideal and manufacturers decided to hold off until pressure-packaging in glass could be developed.

The reason why makers of cosmetics have traditionally used glass jars and bottles are, first, that many beauty aids tend to react considerably when brought in contact with metals. This is true of perfumes in particular because their delicate fragrances are often corrupted in this manner. Second, glass can be made into thousands of more or less exotic shapes and in many different colors, all designed to adorn milady's dressing table. Metal cans, although they can be lithographed and "dolled up," just do not have the necessary sales appeal, according to many of the packagers. (Manufacturers of metal-containers, however, are making determined efforts to overcome some of their product's disadvantages while attempting to educate both

packagers and consumers as to its good points.)

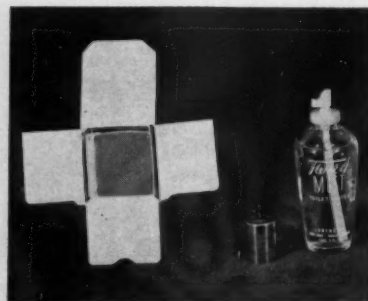
Glass aerosols gained acceptance slowly because most packagers worried about what would happen if a pressurized bottle should be dropped. They visualized fragments of glass, propelled by the contained gas, flying all over a room, and that is what would have happened in the early stages of development. Research staffs attacked the problem with two objectives in mind: preventing the glass from shattering and reducing the pres-

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*The retail value of pressure-packaged goods marketed in 1954 was nearly half a billion dollars and the products ranged from shaving lather to whipped cream. Less than 25 percent of the total was made up of insecticides, the original and once most common aerosol.*

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sure below the danger point. Both goals were reached. A coat of plastic on a glass bottle tends to hold the pieces together if it is broken. Likewise, the pressure (usually about 25 to 40 psi) can be reduced to that in a soda-pop bottle (about 15 psi) and still retain the self-dispensing power. Nearly 50 different cosmetics are now being pressure packed



### MILADY'S SPRAY GUN

Spraying perfume from a pressure container as the young lady is doing is claimed by manufacturers to be the only correct method of application. Bulb-type atomizers are sprayers, but they draw in air which promotes evaporation of the perfume or cologne and changes its delicate fragrance. To protect pressurized glass packages during shipment and shelf-storage, some concerns are using a cardboard carton of unusual design. Cut from one sheet of material, it consists of a box within a box. An open carton of this type for Lenthic's Tweed Mist is shown above with the bottle and its ornamental cap alongside.

in glass in line with one or the other of these findings. Some producers are playing doubly safe by using both the plastic-covered bottle and lower pressure. Valves for glass cosmetic packs are fashioned of metal and inert plastics, but the contents never touch the metal.

Perfumers especially are enthusiastic about the trend because they claim that spraying is the best and correct way to apply colognes and scents. But they do not like to have them come in contact with air any more than necessary because of the consequent evaporation of the more volatile essences. Perfumes are precisely compounded to give them their delicate fragrances, and it is said that each time they are exposed to air enough evaporation takes place to cause a change in the proportion of the ingredients and thus a slight, but to the expert's nose detectable, difference in odor. In a pressure pack, air never reaches the product, but large quantities of air are sucked into a bulb-type atomizer or plastic squeeze bottle each time it is used.

Another desirable property of glass is that it can be left transparent or made opaque with color or by frosting. The latter treatment may weaken a bottle and necessitate the use of a heavier one, but the containers can be pretested for strength by blowing compressed air at 150 psi pressure into them. If they are fragile or cracked they will fall apart under the impact of the blast. They can also be cleaned with jets of air. Glass aerosol bottles are filled in much the same way as their earlier metal counterparts (an article on the subject, entitled *Pressure Packaging*, appeared in our June 1953 issue).

# SKYSCRAPER REVIVAL

The trend is nation-wide, but New York leads as usual

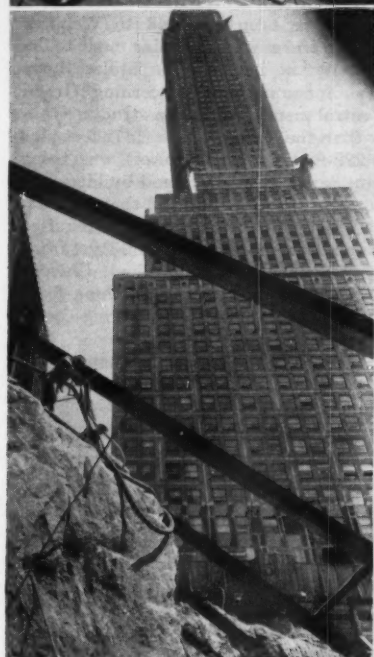
C. H. Vivian



ALL PHOTOS COURTESY CRUCIBLE STEEL COMPANY OF AMERICA

## TWO POINTS OF VIEW

Looking up at the Chrysler Building (left) from the hole dug in New York last summer for the foundation of the Socony-Vacuum Building. A Jackhammer operator is perched on a cliff that remains to be shot away. The other view shows the partly excavated plot as it looked from the eleventh floor of the Chrysler Building. The structure jutting into the working area at the upper left is a subway entrance that remained in service throughout the working period and is being incorporated in the new skyscraper. At its right is a ramp on which trucks climbed to the Third Avenue exit. Lexington Avenue runs along the right side, Forty-Second Street is at the bottom and Forty-First at the top.



**T**HE nation's current building boom includes a sizable quota of tall office structures—a type of construction that has been largely missing for two decades. The reason for the revival is, simply, more people. Our rapidly increasing population needs more places to work as well as more places to live. The flurry of activity in erecting lofty structures is reaching into every part of the country but is naturally more

in evidence in sections to which people are migrating—provided they are going there to work rather than to retire. California, for example, is growing at a rate of 1000 persons daily. To keep up with the increase, \$50 million is being spent annually for state buildings alone. These, as well as municipal structures, nowadays often look like private office buildings. In Detroit, for instance, a new \$88-million civic center includes a 20-story city-county building.

What will be Chicago's tallest office structure—the 41-story Prudential Insurance Building—is nearing completion. It is the first major skyscraper to rise there in twenty years. Its steel framework, which straddles several Illinois Central Railroad tracks, weighs 32,400 tons and will enclose approximately one million square feet of rentable space. The roof will be 601 feet above Chicago da-

tum, exceeding the height of the Pittsfield Building by 44 feet and that of the Civic Opera House by 46 feet.

The structure rests on 187 concrete caissons sunk 110 feet to bedrock. Sixty-six other caissons support the steelwork that carries new viaducts around the building. The 253 caissons range in diameter from 4 to 11 feet. Air-powered spades were utilized to do the excavating, and the material was hoisted in buckets. The railroad tracks running through the site had to be relocated several times to give the diggers access, but this was accomplished without seriously delaying any of the numerous commuter trains that use the line.

All steel was delivered to one site in rail cars and hoisted by one derrick to each erecting floor in succession as the structure rose. The hoisting engineer, stationed at the controls of a diesel-





#### WAGON DRILLING

Two Ingersoll-Rand X-71 drifter drills on wagon mountings are pictured at the bottom when the hole was still rather shallow. The receptacle at the right is a dust collector. The other view shows the result of line drilling done all around the perimeter of the excavation to establish even, unshattered walls.

powered 2-drum hoist located inside the building at ground level, couldn't see what he was lifting. Wearing earphones, he got his instructions from a signalman on the erecting floor who was in continual wigwag communication with a second signalman at first-floor level. As a safety precaution, a red light burned as long as the phone system functioned and went out if it failed, in which event the hoist was immediately stopped.

Denver is getting its first really tall office building, a 23-story structure being erected by Webb & Knapp, Inc., a New York realty firm. It is on a site that was formerly occupied by the courthouse and not far from Cherry Creek,

where gold was panned from gravel in 1859. Excavators for the building's foundation found some yellow flecks of metal and everybody got excited. For a time there was talk of turning the enterprise into a gold-mining venture, but the idea was abandoned. The 4600-ton steel skeleton of the structure was put together with bolts.

Houston, Tex., the nation's fastest growing city (its population quadrupled between 1930 and 1950) has had the highest (44 stories) building west of the Mississippi River for some years and is continually changing its skyline silhouette. A visitor recently remarked that there's a new structure going up every

time you look, and expressed the opinion that they tear buildings down in Houston not when they're old but merely dusty. Being on flat ground, Houston rears its own heights. The nearby San Jacinto Monument, which marks the site where Sam Houston won Texas her independence from Mexico, is 15 feet higher than the 555-foot Washington monument.

New York City of course leads the world in tall structures and is in no danger of losing that distinction. There was, however, a letup in skyscraper construction following the erection more than twenty years ago of the Empire State Building and the group of edifices that constitutes Radio City. Some persons even predicted that no more real lofty structures would rise there, but they guessed wrong. A renewed interest in them has been evident for several years, and there is even talk of tearing down the comparatively squat and sprawling Grand Central Terminal and Pennsylvania Station and replacing them with much higher buildings containing many floors of revenue-producing office space.

The air rights over the tracks at both sites have been optioned to Webb & Knapp and studies are being made to determine the best way to utilize them. The announcement concerning Grand Central mentioned that a structure taller than the Empire State (1472 feet plus a 222-foot television tower) was being considered. Engineers and builders are, however, frankly doubtful that it would be practicable to excavate the required foundation space amid the 2-level maze of tracks beneath the terminal. Chicago has been doing this sort of thing for a long time, but under less trying conditions.

Clinton W. Blume, president of the Real Estate Board of New York, states that 32 large structures containing 17,434,000 square feet of office space have been erected in the Borough of Manhattan since World War II ended. This brings the total available office space in Manhattan to around 115 million square feet, of which some 40 percent was provided during the construction boom of 1925-33. Half a dozen buildings of nineteen or more stories are currently going up, most of them in the midtown section. A 27-story structure on Broad Street is the first big one to be added to the financial district in 25 years.

The largest of the group and the biggest to spring up since the Empire State Building was constructed is now taking form on a 2-acre site flanked on the north by the Chrysler Building and on the west by the Chanin Building, two of the city's most notable piles. Grand Central is only half a block away. Socony-Vacuum Oil Company, Inc., is erecting the 42-story edifice at a cost of \$45 million and will occupy more than

half of the 1,300,000 square feet of rentable space. Bounded by Lexington and Third avenues and 41st and 42nd streets, it will have ground dimensions of 200x420 feet. The completely air-conditioned interior will be served by 35 operatorless elevators.

Turner Construction Company is the general contractor, and the foundation was excavated by Slaterry Contracting Company, Inc. This involved digging to a depth of 42 feet and removing around 300,000 tons of material, about two-thirds of it rock. At the peak of operations, spoil was being loaded and hauled away at the rate of a 12-ton truckful every three minutes. The job was, in fact, the largest of its kind carried out in New York in some years. It was witnessed by untold thousands of sidewalk superintendents, and was even written up in the *Saturday Evening Post* of January 22, 1955.

Ground was broken on March 30, 1954, at which time the block-size plot had been cleared to street level of the miscellany of buildings that formerly occupied it. Remaining in place, however, is the 40x80-foot concrete structure that serves as an entrance to the subway. This juts into the building area on the 42nd Street side. All excavating was done around it without interfering with its use by thousands of riders each day and it will be incorporated in the new skyscraper. The subway is a 4-track line running under Lexington Avenue, which borders the west side of the construction site.

Rubble and earth from 10 to 18 feet thick covered the bedrock when the contractor began work and was disposed of rather easily by loading it into trucks with power shovels. The underlying rock was then attacked by Slaterry crews under the direction of Dudley Saunders,



#### LOADING A HOLE

Nick Pezzente, blaster (left), and two helpers loading a toe hole with dynamite. Pezzente has helped to dig some of Manhattan's biggest basements.



#### DRILLS THAT REACH FOR THE ROCK

Two hydraulic booms, each carrying an X-71 drifter, attached to the front of an old tractor to provide a mobile drilling machine. The 9-foot booms can be extended to a length of 14 feet.

construction superintendent, and Nicholas Pezzente, blasting foreman. Saunders reached his job by way of Cornell University and the Seabees. Pezzente, a veteran drilling and powderman at 47, got his first training in the employ of George J. Atwell, who dug the foundations for the Empire State Building and the Radio City group.

It took five months to complete the rock work, during which time 12 tons of dynamite was judiciously exploded without cracking so much as one of the thousands of window panes in the surrounding buildings. The general plan was to remove a wedge of surface rock towards the center of the plot and establish a grade for a haulage ramp running up from there to one side. This initial opening was then enlarged all around.

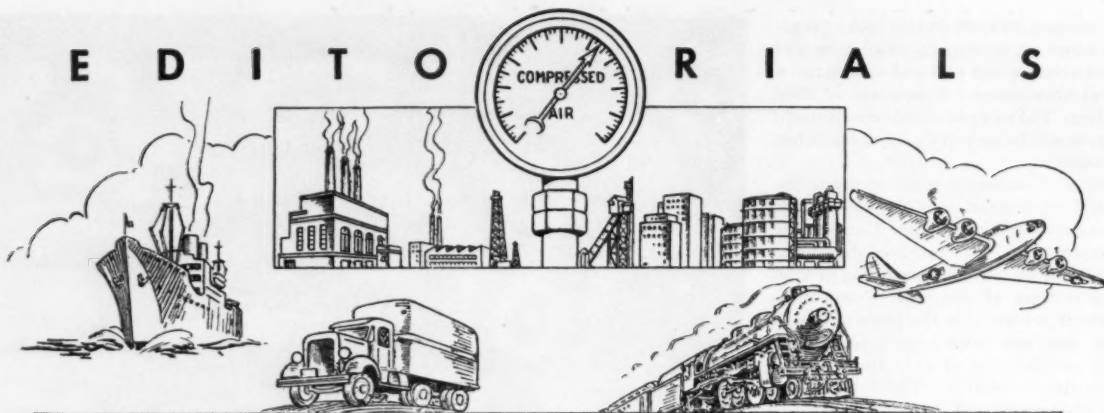
Predominating among the many handheld drills employed were Ingersoll-Rand S-68's, a type that was developed 25 years ago expressly for the island's characteristic foliated rock that is called Manhattan schist. Heavier drifters, especially I-R X-71 models, also were used. Most of them were on wagon mountings, but some were on hydraulic booms attached to old crawler-type tractors that were no longer fit for heavy service. These mobile outfits were especially suitable for drilling slightly inclined or horizontal holes at or near the bases of rock faces.

The wagon-mounted machines put down vertical holes for the most part, and their work included line drilling along the property boundaries on all sides—a combined distance of some 1200 feet. These holes were spaced a few

inches apart and up to 28 feet deep. When other holes 6 feet deep and a few feet out from the property line were shot, the rock usually broke away clean along the line of closely spaced holes, leaving an unshattered and relatively smooth face where concrete walls were poured after successive lifts of drilling and blasting had deepened the excavation to final grade. All drilling was done with Crucible hollow steel and detachable steel bits. The powder charges were fired with split-second detonator caps that provided for four delays. Relatively small shots were set off at a time, and the area to be blasted was covered with 12x12-foot woven-wire mats to prevent rock from flying.

After the rock had been removed to grade throughout the site a 6-foot trench was excavated around the perimeter and 188 holes were sunk for the footings of the columns that were to support the building. These were carried down to rock capable of supporting 40 tons to the square inch. It was tested by the old but still prevailing method of dropping a crowbar in each hole and listening. Sound rock returns a clear ringing tone that gives veteran rock-foundation men the information they want. In this case, the inspectors depended on the judgment of experienced Pete Smith, head drill runner for the Slaterry firm. He has been sinking slender shafts of steel into Manhattan's rocky crust long enough to acquire an intimate knowledge of its strength, and is now trying to see that some of it rubs off on a son who worked with him on the Socony-Vacuum foundation job.

# E D I T O R I A L S



## FOR BETTER LETTERS

SEVERAL pieces of publicity that have come our way lately indicate that there is a growing interest in reviving the somewhat decadent art of letter writing. This is encouraging, to say the least, in an era where millions of persons get their news, views and entertainment by turning knobs on electronic gadgets and reading and writing are in a state of decline.

Someone said recently that an executive is a man who can get a red-headed stenographer to rewrite a letter for the fourth time. He may be an executive, but he certainly isn't a good letter writer. He probably would do better letting the girl write it and that is, in fact, what a surprisingly large number of business and professional men do. "Fix this up, please, Miss Jones, it — er — needs a little polishing," or words to that effect are heard often in many offices.

The coming of the typewriter, shorthand and dictating machines undoubtedly helped to reduce the ranks of capable letter writers. When men used to sit down with a steel pen in hand and grind out their own letters they learned to put their thoughts into a few words that were easily understood. When secretaries relieved them of the drudgery, they soon became verbose, ambiguous and confusing.

Within the past year, the International Correspondence Schools introduced a new course in letter-writing improvement that is designed "to take 1900-vintage letters out of the 1955 business world." Students must submit 64 letters for analysis and correction during their weeks of instruction and take eight examinations.

Probably partly because technical college curriculums are overcrowded with courses, English has traditionally been touched upon rather lightly, but there is a growing appreciation of good letter writing in firms that are heavily staffed with engineers. One of them is Minneapolis-Honeywell Regulator Company. Its Brown Instruments Division, in Philadelphia, Pa., deals in precision products.

Everything about them must be just so, and the engineers have the know-how to make them that way. These men even talk precisely, but they write letters, according to C. L. Scheetz the firm's training director, as though "they were walking on stilts. Many of us," he says, "unless trained to say things as plainly on paper as we do in talking, often 'pace off' a 50-word sentence without realizing it."

A class designed to prune verbiage from the letters was recently organized there. Emphasis is placed on teaching the students to organize their thoughts before dictating. Then they are urged to talk clearly, without benefit of pipe or cigar, using simple words and keeping sentences down to 25-30 words. The objective is to produce letters that "will be opened, read, understood, agreed with and acted upon."

## JOINT ENGINEERING COURSE

A PLAN that is designed to enable boys to get a good engineering education at a reasonable cost will become effective next September when Saint Peter's College of Jersey City, N.J., will begin offering a preengineering course in conjunction with the College of Engineering of the University of Detroit, Detroit, Mich.

Students enrolling in the joint program will study for two years at Saint Peter's and then transfer to the Detroit school for their final three years. This will make a 5-year course, but under the University of Detroit's "co-op" plan students alternately attend classes and work in industry. They change every three months, and thus spend half of each year in academic study and half in on-the-job training.

They not only earn enough money in six months to see them through the year, but also acquire a practical knowledge of industrial engineering that will prove decidedly helpful. The contacts established during the part-time working periods might well lead to permanent employment after graduation. All jobs for un-

dergraduates have to be approved by the job coordinator of the college. Wherever possible, the student is employed in the vicinity of his home, which reduces his living costs. It is claimed also that expenses at Saint Peter's during the first two years are below the average throughout the country.

## THE HIGHWAY PROGRAM

ALTHOUGH Congress is still undecided on the details of the timing and financing, it seems certain that a huge program of roadbuilding will be carried out. President Eisenhower proposed a 10-year, \$101-billion package with at least \$20 billion of the cost to be raised by issuing bonds of an independent highway agency. As this would put the sum outside the pale of the federal debt limit, it has brought many objections and also optional plans. The general impression is that the president isn't too much concerned about how the money is raised so long as the roads are built.

With motor-vehicle registration now 58 million—a gain of 23 million in ten years—and expected to reach 81 million by 1965, the need for more and better highways is self-evident. Construction will probably be centered on 40,000 miles of interstate arteries to serve 65 percent of the urban population and 45 percent of the rural residents. The administration favors giving federal aid in the financing of toll roads, which have heretofore been creations of state governments alone. Its broad viewpoint is that Uncle Sam should defray 30 percent of the over-all cost, leaving 70 percent for state and local financing.

There is no denying that the public has shown a decided interest in good highways. The unexpectedly high returns from most of the toll roads leaves no question on that score. Motorists are obviously willing to pay for more comfortable, safer and time-saving rides, either through tolls or gasoline taxes, so there is little reason to think that they will balk at contributing through other avenues of financing.



## This and That

### Pipe Line Tested With Air

Gulf Interstate Gas Company's recently completed 30-inch line extending from Louisiana to Kentucky was the first large gas transmission system to be cleaned and tested entirely by means of compressed air. Two crews, each equipped with nine air compressors with an aggregate capacity of 800 hp, performed the work. After one section had been tested the air was released into the adjoining one, thereby reducing the demand on the compressors. One of the foremost advantages of using air rather than water is that the inside of the pipe remains dry at all times.

A pneumatic saw also was introduced on this line as an aid in making transition pieces to be placed between 1/2-inch and 3/8-inch-wall pipes. When pipes of different wall thicknesses are welded, a ridge is normally left at the junction and this can be a seat of stress concentration leading to line failure. To obviate this, the engineers adopted the practice of using beveled transition pieces. The new saw makes it possible to bevel pipe both inside and outside in the field so that transition pieces can be produced as they are needed.

\* \* \*

### Canned Drinking Water

Not long ago the idea of canning drinking water sounded as impractical as a week-end trip to the moon.

It could, however, as the American Can Company points out, become vitally important should the country be attacked. Widespread atomic and germ warfare might then make us dependent on safe tinned water.

The need for individual water containers was emphasized during World War II when crew members of a sunken cruiser were unable to open water casks that floated free of the vessel. During the same period the Air Force requested lightweight sealed tins for overseas flights. Medical officers stipulated that they be sized to hold one day's ration—10 ounces of clear water. In addition, they must be buoyant; resist moisture, freezing and boiling; be sturdy enough to remain intact when dropped from a parachute or great height; and be easy to open. The type of can in which beer, juices and soda pop are packaged seems to be the most promising.

The kind of water selected also is of major importance. Usually, surface water is preferable, but the mineral content and relative acidity must be watched; oxygen must be removed to check corrosion and a rust inhibitor added. For the Armed Forces, the exteriors of the tins are given a camouflage coat of lac-

quer to prevent corrosion and reflecting the sun's rays. A small can opener is included in each case.

Canned water has been made available to civilians through department stores in coastal cities, and hunters, fishermen and campers like it because it is convenient to carry. Some hospitals and civil defense units have supplies in storage for possible emergency use, and 500 cases were flown into Kansas when that community became a disaster area because of devastating floods.

\* \* \*

### Movie In a Mountain

The popular conception that motion pictures are shot in plush, comfortable surroundings may be true to some extent in Hollywood, but the crews who produce construction films wouldn't know about that. Take, for instance, the case of the seven men who were sent by Lew Parry Film Productions of Vancouver, B.C., to record rock-drilling history being made by the Aluminum Company of Canada on its Alcan project.

Called "Breakthrough" and sponsored by Canadian Ingersoll-Rand Company, Ltd., the 30-minute motion picture demanded a lot from those to whom the job was entrusted. The main objective was to depict the procedure of driving a tunnel 10 miles through a mountain from four points of access at record-breaking speed and with unerring accuracy.

With Spence Crilly as director, the first trip to the working site at Kemano, 400 miles north of Vancouver, was made in the spring of 1953. Exterior photographs were taken, and the cycle of drilling, loading, firing and mucking at the heading was recorded. That visit also served to familiarize the crew with the booming noise, fog, occasional rock falls, bustling activity and lighting problems that were to become routine difficulties. Illuminating an almost black hole for color photography was an undertaking in itself. The largest single job of lighting was in connection with two shots inside the cathedral-like underground powerhouse. Preparation for a few minutes of camera time required almost twenty hours, and three transformers and more than 100,000 watts were used to illuminate one end of the 700-foot-long cavern.

Scenes around the drill carriage were lighted by means of a 1000-pound transformer, a ton of cables and other equipment, all of which had to be brought to the site by an aerial tramway. During the 5-hour period between scheduled blasts, Crilly and his men had to get all their paraphernalia to the working face more than 2 miles underground; set up their cameras, lights and reflectors; shoot

the sequence; dismantle the outfit and move back before the round was fired. The transformer, which could be plugged into the cable of the mucking machine, converted the voltage from 440 to 110, which the photographers required. The average light load was 50,000 watts and was developed by a combination of Mole Richardson Seniors—huge lamps of 5000 watts each—and special banks of 25 reflector spotlights of 500 watts each designed by Lew Parry for sizable industrial jobs.

The first of the two breakthroughs was filmed on the second trip in October 1953, when the prize-winning Kemano-Horetzky teams, using Ingersoll-Rand drills, met 15,200 feet in from the Kemano adit. The cheering, faithfully recorded on the sound track, was entirely spontaneous and rose to a roar when water dripping from the tunnel roof caused some of the spotlights to explode.

The finale was shot early in December 1953, when the movie crew traveled into the tunnel with cameras and lamps mounted on a special car. At the last moment Crilly put an extra camera in his briefcase. That intuitive act was to save the day, for after the last blast had gone off a flash of light revealed the fact that not all the charges had been detonated. In the ensuing excitement the cameramen were swept too far down the tunnel to take pictures and only Crilly, with his extra camera whipped out of his briefcase, was on hand to film the climax—the breakthrough.

\* \* \*

### Opens Mine At 80

Seven years ago Don Gillies retired from his office of vice-president of Republic Steel Corporation but retained a connection as mining consultant. In the fall of 1953 and at the age of 80 he led two other Republic men into a remote section of Mexico 12 miles inland from the Pacific Coast fishing village of Puerto Angel and 350 air miles from Mexico City. There they did the necessary work preliminary to prospecting and opening up a deposit of titanium ore that is heralded as the richest yet discovered. The ore is rutile, which contains up to 97 percent of titanium dioxide. The deposit had been looked at previously by several companies and passed by because of the ruggedness of the area and the lack of demand for titanium on those occasions.

The mineral vein runs up the slope of a 4500-foot mountain. Camp was established by leveling off the top and prospecting from there downward. Adits driven in at elevations 300, 400 and 500 from the summit stayed in ore, which appears to be about 75 feet wide. A

fourth adit, another 100 feet down the mountainside, will become the main working entry, and ore will be chuted into it from higher levels through raises. Some 35 men have been opening up the deposit while equipment for a concentrating mill is being brought in. Under full development the property will, it is expected, employ from 500 to 800 men.

★ ★ ★

**Quick Rising Planes** Recent developments indicate that the airplane of the future will take off and land almost vertically, making existing long runways unnecessary. Airports will then cease to be "sitting ducks" for enemy bombers, and those used by commercial airlines will, because of the permissible reduction in size, be much closer to urban centers than they now are. A leading aeronautical engineer has even gone so far as to say that "the airfield is obsolete."

All sorts of devices and methods are being tried to give aircraft a quick lift. They include jets that shoot hot gases straight downward; conventional propellers or rotors that can be tilted; and wings that take in and expel masses of air. Both American and British designers are working on the new techniques.

Bell Aircraft Corporation, one of the leaders in this movement, recently put

a small experimental VTOL (vertical takeoff and landing) plane through its paces at Niagara Falls. To quote the *Wall Street Journal*, "Bell's plane showed much more than its ability to fly straight up. The test showed that the ship could be controlled with small jets of compressed air shot out of wing tips and tail surfaces. These air blasts can be used for steering or to tilt the plane's nose up or down. Test pilot David B. Howe said the plane was no harder to maneuver than a conventional ship and indicated that there was no reason why big quick riser planes couldn't be steered by a similar method."

A request to Bell for details about this compressed-air feature brought the response that the control mechanism is still in a classified status and that information would be forthcoming as soon as it is releasable.

★ ★ ★

#### **Costly Copper Wire**

In a booklet dealing with the electroplating of metals, Standard Pressed Steel Company, of Jenkintown, Pa., recalls that the principle on which the process operates was the basis of a meter developed in 1882 by Thomas A. Edison for the purpose of measuring the current used by customers of generating plants. In a plating solu-

tion, metal—copper, for instance—is transferred from the anode to the cathode in a flowing stream of ions or positively charged atoms. The quantity of copper that is exchanged depends on the amount of current introduced and the duration of the flow. This fact was first observed by Michael Faraday and later exploited by Edison, who fashioned a meter containing an electrolyte (a liquid that conducts electricity) and two zinc plates. By weighing the positive plate monthly to see how much metal it had lost the current consumed could be accurately computed.

Representatives of the electric companies used to make the rounds of customers in horse-drawn wagons to replace the meter plates and bring in the spent ones for weighing. The meters were reliable unless human beings tampered with them. On one occasion a meterman was startled when the scales indicated that a clothing store had consumed \$200 worth of electricity in a month. He knew this couldn't be so and began checking. As it turned out, he had forgotten that when he installed the plate, which had previously been weighed, he had clipped off an inch or two of copper wire in order to fit the plate into the meter box. The missing wire had added \$150 to the customer's bill. An electrolytic cell similar to Edison's meter is used today in standardizing ammeters and galvanometers. Copper or silver is deposited upon a platinum cathode that can be removed and weighed.

★ ★ ★

#### **Record Tow of Tankers**

A record in marine history was made recently when Island Tug & Barge Limited completed a 4000-mile single-line towing operation from Balboa, Panama Canal Zone, to Victoria, B.C. Over-all length of the 2-tug towing system was more than 4500 feet, and was arranged so that either ship could cast off any time and leave the other to handle the line. During the trip, radio-telephone communication was maintained between the two vessels.

The SS *Sudbury* and the *Island Sovereign*, flagships of the company's salvage and special towing fleet, made the voyage nonstop in 32 days with four 325-foot oil tankers, even battling near gale-force winds off the California coast for two days. The tugs traveled abreast with their tow single file. Known as Maraibo Lake boats, the steel tankers were built to carry 25,000 barrels of oil and were the forerunners of the LST's. With their flat bottoms and shallow draft they are well suited for conversion into self-dumping log barges, a project that is soon to be undertaken and will take a year to complete. Each vessel is expected to transport up to 1,250,000 feet of logs.



#### **CAR SWITCHING IN CUBA**

After raw sugar has been made from cane in Cuba, it is bagged and transported by rail from the "central" or processing mill to a port where it is stored until ships are available to carry it to the United States for refining. In Matanzas, spotting of the cars at the warehouse door is done by bull power. Our picture shows two pairs of these powerful animals removing two cars that have just been emptied. Up to four teams are used to pull full cars. The photograph was taken at one of the warehouses of the Compania General Cubana de Almacenes Publicos and is reproduced through the courtesy of American Hoist & Derrick Company, St. Paul, Minn. It was taken by the firm's advertising manager, S. C. Brown.

## El Salvador Strives for Industrialization



### EQUIPMENT AT LAKE DE GUIJA

To excavate the foundation for the dam at Lake de Guija, the contractor, Padilla-Cuellar, operated a JHM wagon drill (right) and three J-50 Jackhammers with air from the 315-cfm GYRO-FLO portable compressor shown. In abrasive basalt rock, Carset (tungsten-carbide insert) Jackbits averaged 1500 feet of hole each.



WITH the recent opening of a new hydroelectric plant, the Central American nation of El Salvador finds itself with an adequate supply of electric power for the first time. The station, the largest on the intercontinental isthmus, now contains two 15,000-kw generators and went into service last September. Provision has been made for the installation of a third unit of the

same size when the demand for additional current warrants it.

Built under the supervision of the Comision Ejercitiva del Rio Lempa, an agency of the national government, the plant is located at Guayabo on the River Lempa and near the Honduran border. To insure the necessary volume of water, a secondary dam, approximately 40 feet high and 200 feet long, is under construc-

tion in the north-central section of the country at the outlet of Laguna (Lake) de Guija, which feeds the Rio Desague. This waterway enters the Lempa about 5 miles downstream from the dam site. The structure will impound 162,000 acre-feet of water for the present and may later be heightened sufficiently to capture 405,500 acre-feet. This stored water will be released during the dry season, as needed, to stabilize the downstream flow for sustained power production.

In order to utilize fully the increased generating facilities, transmission lines will be extended during the next four years to various parts of El Salvador and, possibly, to both Honduras and Guatemala. All the Central American countries have been short of power and, realizing that electricity is essential to industrialization, they have, jointly, been surveying their hydroelectric potentialities. Recent high prices received for bananas and coffee, their principal exports, have given them a measure of prosperity, but with an eye towards meeting the less favorable economic conditions that will probably come sooner or later they are striving to attract industries.

For the time being, the Guayabo plant is providing a surplus of power, but that situation is not expected to exist for long. Two establishments—one that will turn out fertilizers and the other chemicals—have already been built in El Salvador, and it is reported that several American manufacturers of consumer goods are planning to establish branch factories there.

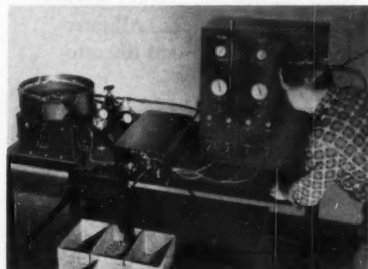
### Air Gauge Rejects Substandard Work

ANOTHER step towards automation in the steel fabricating field has been made through the development of an automatic sorting gauge that was built by Moore Products Company for the Carnegie, Pa., plant of Superior Steel Corporation where it is used to measure both the wall and base thickness of copper-clad bullet jacket cups. Actual gauging is done by means of air jets, which do the work in one operation.

The workpieces start on their way to the gauge by "walking" up an incline in a vibratory screen on which they ar-

range themselves properly before sliding down a chute to be brought into gauging position by an air cylinder that is timed to handle 2500 units an hour. Actual dimensions are indicated on large dials. These are amplified in a ratio of 2700 to 1, and the measurement signals are picked up by a system of pneumatic relays which actuates electrical sorting gates that segregate the unacceptable cups from those that are within tolerances. Four sortings are made automatically: cups under or over tolerance in wall thickness; over tolerance in base thickness; under tolerance in base thickness; and that meet all specifications.

In line with the latest standards in automation, the equipment is said to be both safe and positive in action. There is no chance of marring a cup, of injuring the operator's fingers, or of substandard bullet jackets escaping detection. The design is such that electric, air or equipment failure will either stop the gauge or classify all work as unacceptable.

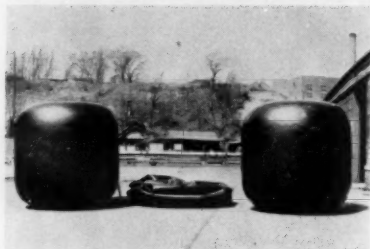


Circle 1E on reply card



## Industrial Notes

Since 1951, when collapsible rubber-fabric shipping containers were introduced by the United States Rubber Company, the capacity of the units has been increased from 55 to 500 and 2500 gallons. The maximum size, which is pictured, is 8 feet both in height and

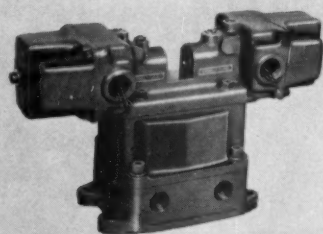


diameter when filled; empty for return shipment and reuse, it occupies the same circular space but is not more than 2 feet high. The 500-gallon size is 7 feet high and 3 feet 10 inches in diameter; collapsed, it is a little more than 6 feet long, 3 feet wide and 10 inches high. Both are suitable for transporting granular and powdery materials such as carbon black, sugar, starch, flour, etc., and are being used to ship polyethylene, polyvinyl chloride and other chemicals. Like tires, the holders are made of plies of cord fabric and synthetic rubber

molded in one piece and reinforced with extra plies at points of greatest stress and internally with cables attached to a lifting ring at the top. To facilitate filling and emptying, they have two openings, one at each end. The larger unit may be charged with air or gas when loaded to give it added rigidity during transit and handling. Seald-Bins, as they are called, may be transported by barge, rail or truck and are said to be vermin-, leak- and weather-proof and to withstand continued hard service without damage or loss of contents. They may be leased at a monthly rate and obtained in other sizes to meet users' needs.

Circle 2E on reply card

Numatics Operating Valves has introduced a new series of double-solenoid, pilot-operated air-control valves available in 40 different models ranging in pipe sizes from 1/4 inch through 1 inch. Included are momentary-contact 4-way units of the single- or dual-inlet type; 3-position, spring-centered 4-way valves (with both cylinder ports open either to supply or to exhaust, or with one port open to supply and one open to exhaust); and double 3-way models (with both sides normally closed or open, or with one side normally open to supply and one closed). They are designed for



pressures from 5 to 125 psi and will operate under a vacuum. Side and bottom porting is standard. Valves are sealed oil- and dust-tight and solenoid covers are fastened with screws that stay in place when the former are removed.

Circle 3E on reply card

The Hagan Ring Balance Meter, which is commonly used for flow metering of all kinds, is available for an unusual purpose; that of controlling the water level in high-pressure accumulator bottles for pumps that power hydraulic presses of 2000 psi and up. For this service, the accumulator bottle is of the air-loaded type. The ring balance meter measures the water level directly, any change in level causing the ring to rotate. This, in turn, opens or closes mer-

DRI AIR MAY BE INSTALLED BY SUSPENDING IT FROM THE PIPING WITHOUT ANY OTHER SUPPORT.

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WRITE FOR BULLETIN DA-1 WHICH FULLY DESCRIBES THE CONSTRUCTION AND OPERATION OF THE DRIAIR.

## NEW JERSEY METER CO.

"SPECIALISTS IN COMPRESSED AIR DEVICES"

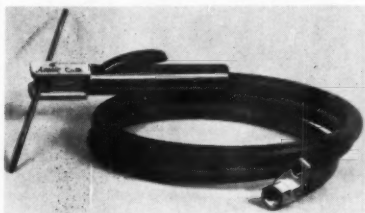
PLAINFIELD,

NEW JERSEY

cury switches in a sequential order and makes it possible to control the pumps automatically. Each unit is started by a decrease in water-bottle level, which actuates a mercury switch when a predetermined point is reached; it is shut down when the level rises to a second predetermined point. Switches are staggered to bring in the pumps as required to meet load demands.

Circle 4E on reply card

Since we described the Arcair cutting and gouging torch in our September 1954 issue, the company has designed the G-2, a smaller model intended especially for maintenance jobs and light repair work in small shops. It uses electrodes up to 1/4 inch in diameter. Like the other units, it operates from an ordinary d-c welding machine and compressed-air line and has a concentric cable through which the electric current and air are delivered to a rotating nozzle



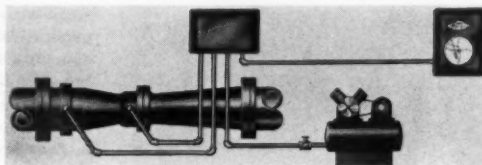
that permits changing the electrode angle but keeps the air jet in alignment. The torch can be utilized to groove, bevel and cut metals, to remove defects in castings and forgings, to clean the roots of welds and to gouge out welds. Slag does not hamper the cutting action, and the depth of the cut is adjustable.

Circle 5E on reply card

Laminair is the name of a pneumatic transmission system that has been developed by the Simplex Valve & Meter Company to provide accurate and sensitive instrumentation for fluid measurement. It is designed to balance a single air pressure against any differential pres-



sure produced by a venturi tube, flow nozzle, orifice plate or the difference between two existing levels or pressures and to transmit the resultant pressure to an instrument that may be mounted at a considerable distance from the primary device without considering hydraulic elevations at the point where that instrument is located. The unit consists of two main groups of mechanisms: a differential converter that converts the fluid pressure to air pressure; and a bellows-type receiver that translates air



pressure into terms of measurement recorded by suitable instruments. A self-contained compressor with a capacity of a few cubic feet will suffice for the average small-community filter plant or meter installation because the converter consumes only about 0.1 cfm of free air.

Circle 6E on reply card

Floors, walls, pipe lines, bins, etc., in refineries, plants, mills, and other establishments where flammable gases, vapors, chemicals and dust present a hazard can be cleaned with safety by a new vacuum machine, according to the manufacturer, Multi-Clean Products, Inc. The cleaner is said to be explosion-proof and is suitable for either dry or wet pick-up, even for removing combustibles from tanks.

Circle 7E on reply card

For treating boiler water, National Aluminate Corporation is offering four formulas each made up in the unusual form of balls about 3 inches in diameter

and weighing 1 pound. They are placed in a special feeder of by-pass design into which some of the feed water is piped. As the chemicals dissolve at a controlled rate by means of a calibrated needle valve, the solution is carried back into the main feed-water line. Known as the Nalco 400 System, a company representative is available to determine the formula to be used in each case.

Circle 8E on reply card

For friction testing brake linings and similar materials, the Link Engineering Company and T. P. Chase have developed a machine based on the principle that if a loaded specimen is held and



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Assures low break-away on long idle units — ample sealed-in oil for thousands of cycles without attention.

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**COMBINATION VALVES**  
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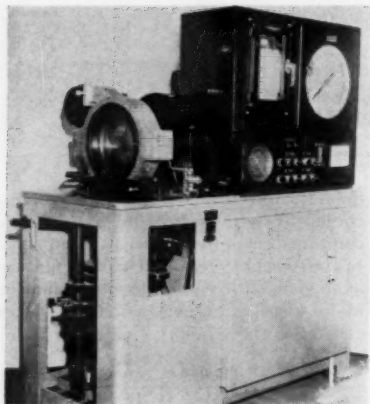
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**Lehigh Minor AIR VALVES and CYLINDERS**  
Low priced, light duty. For air operated jigs, fixtures, high speed operations.



made to ride on the rim of a revolving drum and at a point on the vertical center line a horizontal friction force tangent to the drum surface will result. In service, a specimen 1-inch square is held in a hinged block that insures uniform transverse distribution of pressure and permits easy examination or replacement of the test piece. Samples can be loaded in 25-pound increments up to 200 pounds. Release of the load and cycling of the operation are effected by a pneumatic cylinder using air at a minimum pressure of 50 psi. Cycling is controlled electrically and is adjustable from 10-second to 2-minute intervals. Because

work with such small specimens does not generate sufficient heat, electric heating elements have been installed in the drum housing to raise the temperature well above the critical temperature of most friction materials. The machine features a pressure-sensitive restraining device that keeps the test piece on the vertical center line regardless of any variation in frictional force and measures and makes a continuous record of the characteristics of the material. The measuring unit itself controls the position of the loading unit—keeps it within the plane of rotation of the force of two ball end links—and thus obviates the need of considering losses that might otherwise affect the recorded friction force.

Circle 9E on reply card

Nylon cord in sizes Nos. 18 and 21 is being made by King Cotton Cordage as a substitute for masons' cotton line. It is said to be four times as strong, will not absorb moisture, and when stretched will remain taut.

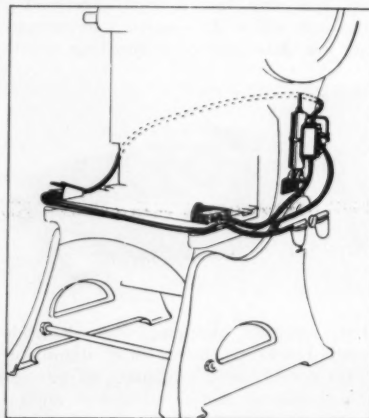
Circle 10E on reply card

A camera so small and light that it can be carried like a cigarette lighter or fountain pen is being distributed in America by Kling Photo Corporation. A Minox product and originally developed for espionage purposes, it measures 1x3x5/8 inch and features an F:3.5 fifteen-

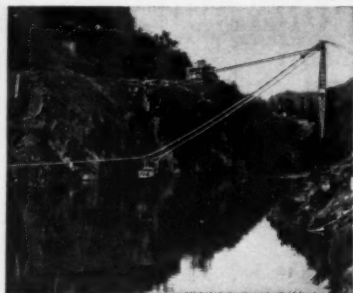
mm focal-length lens; has a focusing range from 8 inches to infinity; automatic parallax correction at all distances; eleven shutter speeds from 1/2 to 1/1000 second; and built-in green and orange filters. It is available in gold-plate or satin-chrome finish with a measuring-safety chain to match and leather case.

Circle 11E on reply card

For the control of brakes, shears, power presses and other machinery using mechanical clutches, Modernair Corporation has developed a packaged pneumatic control designated as PMC. Complete with valves and all components except hoses, it operates on air from any shop line. A feature of the unit is a new valving system which is said to insure positive control and makes it necessary to manipulate both valves simultane-



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900-ft. Tautline conveys 4-cu. yd. bucket to dam site.

A Sauerman Slackline or Tautline Cableway . . . with one man at the controls . . . can reach out 1,000 ft. or more. The Slackline is unexcelled for deep digging, especially under water. The Tautline is best for long range aerial crane work.

Sauerman machines lift, haul and dump any bulk material. Installations span pits, ponds, rivers or canyons. Slackline sizes: 1/3 to 3 1/2 cu. yds. Tautlines: up to 25 tons. Operation cost: just a few cents per cu. yd. handled. Consult Sauerman engineers for specific information on your particular requirements.

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ously for one nonrepeat action, thus keeping operator's hands out of harm's way. Valve levers are shielded to prevent accidental tripping. The PMC is available in 2- and 3-inch cylinder bores and with any desired length of stroke.

Circle 12E on reply card

Teflon yarn packing that is designed to function at high peripheral speeds has been announced by Crane Packing Company and is recommended especially for rugged and corrosive service on pump shafts and valve stems. It is tightly braided by a special process to insure density and firmness and to eliminate large voids. For use where lubricants are required, the packing can be impregnated with Fluorolube or other compounds. It is made in sizes from 1/8 through 5/8 inch in 1/16-inch gradations.

Circle 13E on reply card

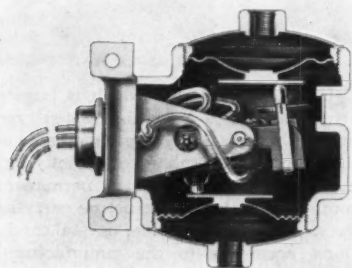
Designed primarily to separate water from the exhaust of water-sealed vacuum pumps, Burgess-Manning Company's new snubber also reduces the exhaust noise to ear-comfort level. It is said to be the first device of its kind to perform both functions simultaneously and is intended for service where maximum si-



lencing is essential. The water and air enter the snubber through a side opening and are separated by centrifugal action, the gas being discharged at the top and the water at the bottom. Designated as the WSS, it can handle water containing a percentage of impurities such as settlings and be cleaned conveniently.

Circle 14E on reply card

It is claimed that Barksdale Valves' new Meletron, Model 426, accurately senses any pressure difference from 0 to 99 psi between two pressures within the working range of 0.05 to 100 psi. Each unit actuates an electric circuit on in-



crease or decrease of any predetermined pressure difference within its range. It is readily adjusted by means of a ratchet, and a tamperproof cover protects the setting against accidental disturbance. The entire mechanism is encased in a splashproof housing to keep out dust and to prevent damage. Jarring on mobile installations or vibration from pumps or compressors do not affect the functions of the switching or pressure-sensing elements, it is reported.

Circle 15E on reply card

Electrical maintenance workers, especially, may be interested in new self-sticking wire markers that are said to withstand continuous heat up to 300°F, intermittent heat to 450°F, and continuous cold to minus 300°. They are mounted on a handy dispenser card that is treated to facilitate stripping and are coated to keep them clean and legible. Two sizes are carried in stock—1½-inch long, for wires more than 1¼ inches in outside



"Mind if I make a suggestion, Miss Roberts?"

diameter, and ¾-inch for small-gauge wires—and 2000 color, number, letter and symbol variations. Samples are available upon request from the W. H. Brady Company.

Circle 16E on reply card

A safety panel has been introduced by the Instrument Division of Stewart-Warner Corporation for the protection of unattended or remote-controlled engines from burned bearings, frozen pistons or other failure. It is designed for units with battery ignition such as serve oil rigs, irrigation and sump pumps, generator sets, air compressors, etc., and automatically shuts off an engine, it is claimed, when the oil pressure drops below a preset point or when the temperature rises to a dangerous level through inoperative pumps or other causes. Panels for magneto-ignited and diesel engines also are available.

Circle 17E on reply card

Wilkerson Corporation has announced a new snap-action automatic float unit for separating moisture and other contaminants from compressed air. Known as the Series 150, it is stocked in sizes for ¼- to 3-inch lines and operating pressures ranging from 10 to 250 psig. They occupy less space than the models they are replacing and are designed for continuous or intermittent flow, function-



ing, it is claimed, without pressure drop and flutter. Because the float triggers the moisture discharge—does not actually open and close the port—the efficiency of the unit is said to be high. A built-in filter screen protects the working parts against rust and grit.

Circle 18E on reply card

Poly-Cell is the name of a new liquid insulation consisting of a mixture of resinous compounds. The material is ap-

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### LUBRICATES AND RUST PROOFS PNEUMATIC TOOLS!

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to Prevent  
Air Loss

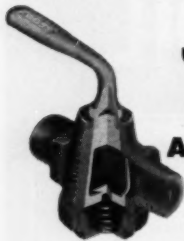


## "AIR KING" Quick-Acting HOSE COUPLINGS



For All Hose Connections

These plain rugged couplings are your surest safeguard against loss of air at the hose connections. Universal locking heads, on sizes up to 1", snap together to form a secure lock that is leak-proof under pressure; in fact, pressure must be released before coupling can be disconnected. Ideal for rough outdoor work as well as indoor shop and plant service. Malleable iron, cadmium plated, and bronze. Hose Ends, Male and Female I.P.T. Ends. Size range, 1/4" to 1". Also available in 4-lug type, not universal, in 1 1/4" to 2" sizes.



## "BOSS" Self-Honing AIR VALVES

For the Entire  
System

The most efficient and economical valves for all valve stations on the system—automatically, permanently leakproof—no packing to wear out and replace—straight-line, full-flow opening through body and plug. Self-adjusting bronze plug automatically hones itself against harder steel or malleable iron valve body, maintaining a perfect leakproof seat. Proper spring tension assures constant sealing adjustment. Strong, durable construction, with handle attached to plug within the valve body. Male or female thread both ends, in sizes 3/4" to 1 1/2".

Stocked by Manufacturers and Distributors  
of Industrial Rubber Products

# DIXON

Valve & Coupling Co.

GENERAL OFFICES & FACTORY—PHILADELPHIA 22, PA.  
BRANCHES—CHICAGO - BIRMINGHAM - LOS ANGELES - HOUSTON  
DIXON VALVE & COUPLING CO. LTD. TORONTO. Associate Companies:  
Buck Iron Company Inc., Quarryville, Pa. - Precision Steel Company, Camden, N.J.

Circle 22A on reply card

Adv. 23 (124)

plied by a special spray unit that keeps it at the right temperature until it leaves the gun, when it foams to nearly twenty times its original volume. According to the manufacturer, Insul-Mastic Corporation of America, a gallon will give a surface of 100 square feet a coat 3/8 inch thick that is semirigid when dry. It is claimed that the insulation will provide good protection between minus 40 and plus 225°F and that it will not support combustion even though it melts in contact with flame.

Circle 19E on reply card

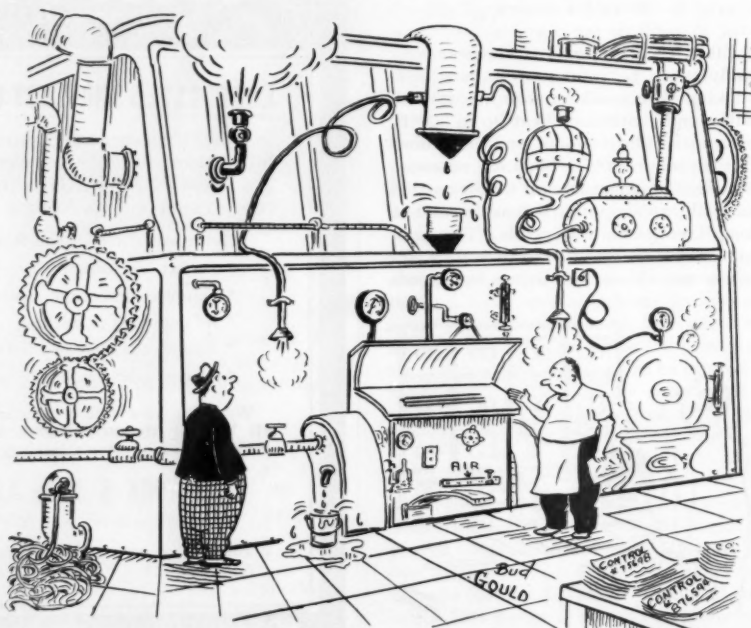
By providing each of its thirteen 5-gallon cutting-oil tanks serving high-speed routers and drills with an upright sight gauge, Temco Aircraft Corporation has saved itself a lot of trouble. The instrument is a 9-inch-long Plexiglas tube connected by a small elbow joint on one side and just above the bottom of each reservoir so that the oil in both tank and gauge are at the same level. Now the oiler, instead of stopping each machine, climbing on its slippery table, removing the filler cap from and squinting inside the reservoir with the aid of a flashlight, can tell at a glance from the aisle which tanks need replenishing. The method can be used only with a gravity-feed system.

A storage battery designed specifically for emergency lighting by the Exide Industrial Division of The Electric Storage Battery Company is said to be the first of its kind to receive the approval of Underwriters Laboratories, Inc. The useful life expectancy of the 3-COE-7 Tytex, as the unit is designated, is from



eight to twelve years, which is largely attributable to 1/4-inch-thick pasted-type positive plates, heavy negative plates of rugged construction, and a specially formulated active material in permanent contact with the grid structure carrying the electric current. Under normal conditions, according to the manufacturer, the battery requires additional water only once or twice a year, and short circuits are prevented by triple inert plastic and rubber insulation. The state of the charge is indicated by colored pilot balls floating in vertical channels at the corners of the housing, which is made of polystyrene, a clear heat-resistant plastic that is chemically stable and impervious to the electrolyte. Several styles and capacities are available.

Circle 20E on reply card



"It's a machine that interprets government regulations."

COMPRESSED AIR MAGAZINE

## QUOTES

—FROM HERE AND THERE

### Air Power for Model Railroads

"Here's something new for model railroad enthusiasts. You can now go another step nearer to the real thing by applying pneumatic power.

"For the pneumatic operation of model switch points, Raymark Products Co., have introduced a range of pneumatic components of extremely small size. Components so far offered, with model railroads chiefly in mind, include one size of cylinder, a three-way control valve, manifolds for feeding up to ten single valve and cylinder circuits, tees, connectors,  $\frac{1}{8}$  inch bore plastic tubing, adapters for connection of the tubing to a  $\frac{1}{8}$  inch pipe thread, air receivers and pressure gauges.

"The cylinder is of  $\frac{3}{8}$  inch bore,  $\frac{1}{2}$  inch outside diameter and has a  $\frac{1}{2}$  inch stroke. Length of cylinder is  $1\frac{1}{8}$  inch, total length of unit including foot mounting bracket is  $1\frac{3}{8}$  inch. The cylinder is of single-acting type with spring return, piston is sealed with single Neoprene O-ring. The three-way type valve has one inlet, one outlet and one exhaust port, is  $1\frac{3}{4}$  inch long and its maximum diameter is  $1\frac{3}{16}$  inch.

"The units, of rugged construction, will operate equally well on compressed air, suitable gases or water."

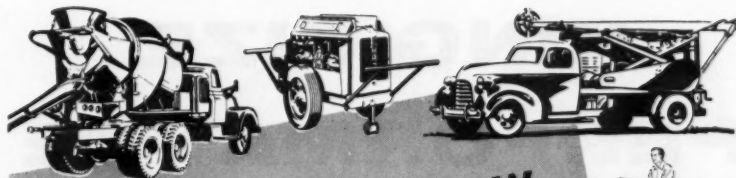
*Applied Hydraulics, February*

### Vacuum Furnaces for High-temperature Alloys

"The commercial production of vacuum-melted high-temperature alloys for jet-engine aircraft, atomic-energy installations, and other special needs posed many challenges during 1954. Design of and preliminary preparation for installing vacuum-melting pilot-plant facilities were the year's biggest projects. Vacuum furnaces capable of handling 100 to 1000 pounds of high-temperature alloys will be set up by April, 1955. (Present facilities include a 400-pound vacuum furnace.)

"To fully utilize all of this unusual equipment, the development of alloy systems for operations in excess of 1600°F is being pushed. These alloys will probably be made of a nickel or cobalt-chromium base, hardened with molybdenum, tungsten, carbon, titanium and aluminum.

"The vacuum-melting technique not only increases the high-temperature strength of certain alloys but also improves the yield. That is, the ratio of the finished product's weight to the ingot's weight is increased. From a practical standpoint, this technique is a controllable method of facilitating the melting of highly reactive metals on a large

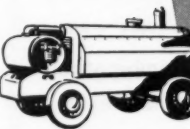
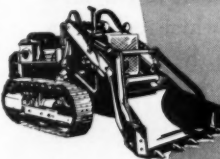
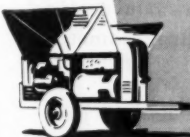


**GOOD RULE TO FOLLOW  
WHEN BUYING  
ANY SPECIALIZED MACHINE:  
CHOOSE A MAKE WHOSE BUILDER THINKS  
ENOUGH OF HIS OWN GOOD NAME TO  
EQUIP HIS PRODUCT WITH**

### •CONTINENTAL RED SEAL POWER•

Within Continental's range, from two to 1,100-horsepower, it would be hard to name a type of engine-driven product—vehicle, aircraft, boat, or industrial machine—of which one or more of the leading makes do not rely today on Continental power. As might be assumed from the current trend toward greater specialization, the list of such applications is longer than ever before. The field of Red Seal usefulness has broadened to the point where—as this list suggests—there is almost no end to the industrial uses of dependable Continental power.

Air Compressors • Air Conditioners • Backfillers •  
Balers • Ballast Packers • Batching Plants • Binders •  
Blowers • Bulldozers • Choppers • Cement Cutters •  
Concrete Finishers • Concrete Mixers and Pavers •  
Conveyors • Cranes • Crash Trucks • Crop Dusters •  
Derricks • Ditchers • Drag Lines • Drill Rigs • Earth  
Rerers • Earth Movers • Electric Welders • Elevators •  
Ensilage Cutters • Excavators • Fog Generators •  
Gathering Pumps • Graders • Hay Loaders •  
Heavy Engine Starters • High Lifts • Hoists • Ice  
Machinery • Industrial Tractors • Irrigation  
Pumps • Loaders • Lumber Carriers • Materials  
Handlers • Mud Pumps • Oil Field Machinery •  
Pipe Benders • Portable Generators • Rollers •  
Rock Crushers • Separators • Shovels •  
Sprayers • Street Flushers • Street Sweepers •  
Trucks • Winches • Vibrators • Warehouse



SERVICE FACILITIES AND GENUINE RED SEAL PARTS ARE AVAILABLE EVERYWHERE

6 EAST 45TH ST., NEW YORK 17, N. Y. • 6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS •  
3817 S. SANTA FE AVE., LOS ANGELES 58, CALIF. • 918 S. BOSTON ST., ROOM 1008,  
TULSA, OKLA. • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA.

**Continental Motors Corporation**

MUSKEGON, MICHIGAN



# KING SIZE PERFORMANCE

*with NAYLOR Lightweight Pipe*



It's no trick to get king-size performance from air and water lines in construction service when you use Naylor large diameter lightweight pipe.

Naylor is the one lightweight pipe built to handle jobs normally requiring heavier wall pipe. That's because of Naylor's exclusive lockseamed, spiralwelded structure which creates a pipe that is recognized for its greater strength and safety.

Its light weight makes Naylor pipe easier to handle and install, particularly with the one-piece Naylor Wedge-Lock Coupling to speed connections. Pipe sizes range from 4 to 30 inches in diameter.

For the complete story on this distinctive combination, write for Bulletins No. 507 and No. 513.



1245 East 92nd Street, Chicago 19, Illinois

Eastern U. S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

Circle 24A on reply card

scale. For example, vacuum melting opens the way for the use of such reactive elements as titanium, zirconium, and aluminum in alloys in higher percentage than possible with conventional melting methods."

*General Electric Review, January*

## Lubricant Code Ends Confusion

"What with the many different types of lubricants used in and around a steel mill—and this number compounded by the many different brand names—getting the right ones for the right applications is vital. So the Geneva Works (U. S. Steel Corporation) devised a code system that simplifies the job.

"Each lubricant has an alphabetical symbol and numerical value which readily identifies its application limits. The coding system has been beneficial, too, in developing more than one source for a lubricant. Each supplier is required to stencil the Geneva code number on each drum head, no matter what other identification may already be shown there."

*D. P. Thomas in Steel, January 17*

## Industrial Literature

Hydro-Line Manufacturing Company has issued an 8-page catalogue which describes and illustrates its all-steel precision-built S series automation cylinders and mounts.

Circle 21E on reply card

A new combination catalogue and net-price selector for its True-Set and Windsor lines of chucks has been published by E. Horton & Son Company's Chuck Division.

Circle 22E on reply card

Steel, wood and rubber-covered tanks of various types made by Denver Equipment Company are illustrated and described in Bulletin No. T2-B5, which also deals with the firm's line of overflow launders.

Circle 23E on reply card

Bulletin LR-1 published by Henry Vogt Machine Company covers its liquid receivers for ammonia and Freon ranging in volume from 1.36 to 115.1 cubic feet. Data on cast-iron stands for the tanks are also given.

Circle 24E on reply card

Bulletin GEA-6153 available from the General Electric Company describes Tri-Clad "55" drip-proof and enclosed poly-phase and single-phase motors from 1 to 30 hp as well as a new starter for oil-well pumping.

Circle 25E on reply card

Bulletin 50 obtainable from Wilson Engineering Corporation describes its improved Woodruff Syphon Jet Vacuum Cleaning System. Of the heavy-duty industrial type, it uses compressed air which is converted into suction.

Circle 26E on reply card

For the use of its own field workers, Allis-Chalmers Manufacturing Company has issued a 75-page pocket-size safety manual that has general application. Prepared by its Industrial Relations Division and Field Service Department, the booklet covers every possible phase of the subject from the

handling of tools and equipment, lifting and carrying and fire prevention to the dangers of acids and dust, the treatment of surgical shock and burns, artificial respiration, etc., etc. It is also designed to serve as an instruction book in training men for jobs in the field.

Circle 27E on reply card

Bulletin A-105K offered by Miller Fluid Power Company gives complete data on the design, construction, engineering, mounting and dimensions of its 200-psi heavy-duty air cylinders with bores from 1½ through 14 inches, strokes through 22 feet and seventeen standard mounting styles.

Circle 28E on reply card

Bulletin No. 3037 published by The Imperial Brass Manufacturing Company covers the firm's varied line of fluid-control valves for use in refineries, pharmaceutical plants and laboratories, for instrumentation purposes, for compressed-air and vacuum systems and precision flow control.

Circle 29E on reply card

Free literature is obtainable from Cambridge Filter Corporation on its new high-efficiency Aerosolve Filter for comfort and industrial ventilating or air-conditioning systems. It is the result of three years of research in conjunction with Arthur D. Little, Inc.

Circle 30E on reply card

The design, construction and operating details of Colonial Broach Company's "4" Convertible Broaching Machine are discussed in Bulletin FW-55 now available. The multipurpose metalworking machine is capable of horizontal pull broaching, vertical push and pull-down broaching and press work.

Circle 31E on reply card

The purpose of a 16-page brochure (No. 700), published by The Frick-Gallagher Manufacturing Company, is to demonstrate that greater warehouse economy and sizable space savings are nearly always possible by making better use of existing facilities and taking advantage of storage equipment.

Circle 32E on reply card

An illustrated bulletin, No. 427, which discusses "dag" colloidal graphite as a parting compound has been issued by Acheson Colloids Company. Specific dispersions for many industrial uses and methods of application such as the new stencil-pattern technique for controlled welding are presented.

Circle 33E on reply card

The Cylinder Conomotor, a new pneumatically positioned power operator for throttling control service, is fully described in Conoflow Corporation's Bulletin B-50-2. The 12-page booklet illustrates many applications, including proportional control of speed changers, valves, pumps and electrical components.

Circle 34E on reply card

Federated Metals Division, American Smelting & Refining Company, is offering Bulletin 103 which presents updated natural aging curves for Tenzaloy, a high-strength aluminum casting alloy that ages at room temperature and acquires mechanical properties equivalent to those normally obtained by heat treating.

Circle 35E on reply card

Compressors in the 330- to 660-hp range driven by gas engines are the subject of a 44-page bulletin released by Ingersoll-Rand Company. The machines are of the SVG

**CARBON-  
BAKELITE  
PISTON  
RINGS**

**METALLIC  
PACKINGS**

**POWER  
PISTON  
RINGS**

**BAKELITE  
VALVE  
DISCS**

**57 YEARS OF PROGRESS**

**and  
we're still growing!**

Original equipment for engine builders or replacement packing piston rings or valve discs for the gas, oil and chemical industries — all are expanding lines in our production 'family tree.'

FRANCE offers you not only the finest engineering and consistent quality in these products, but also the SERVICE demanded by industry.

Get the facts and get SERVICE . . . from FRANCE.



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PHILA. 15, PA.

**For full information—MAIL COUPON NOW!**

**FRANCE PACKING CO.**

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NAME .....

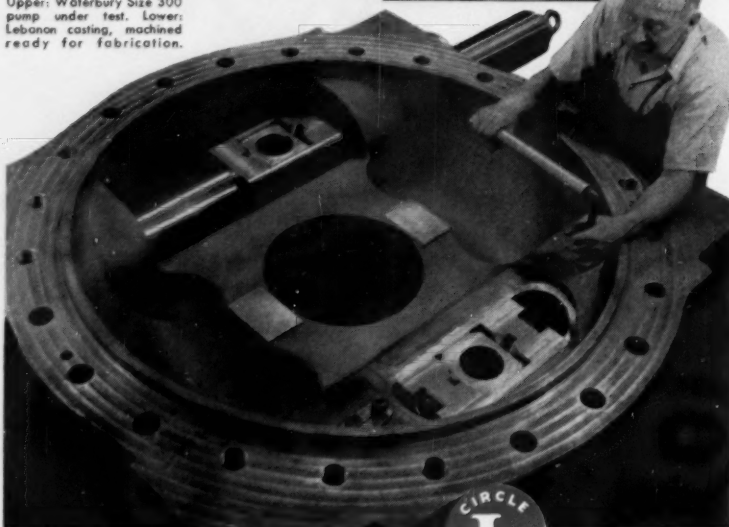
TITLE .....

COMPANY .....

ADDRESS .....

in the  
**World's Largest**  
oil hydraulic pumps

Upper: Waterbury Size 300 pump under test. Lower: Lebanon casting, machined ready for fabrication.



**LEBANON STEEL** **Castings**  
**are at work...**

IN WATERBURY TOOL'S SIZE 300 PUMPS—largest oil hydraulic high-pressure pumps ever built—dependable Lebanon CIRCLE L castings help confine the tremendous forces developed. These pumps are the working heart of the world's largest tube reducing machine being built by E. W. Bliss Company for Tube Reducing Corporation. On the tube reducer these pumps will move the equivalent of three fully loaded freight cars three feet forward and three feet backward—every two seconds! Each pump weighs 21½ tons, is capable of delivering 2300 gallons per minute at pressures up to 3000 p.s.i. and can transmit up to 4000 H.P.

Lebanon steel castings in the pumps for this extraordinary machine that cold rolls tubing up to 18" O.D., were engineered and built for enduring service.

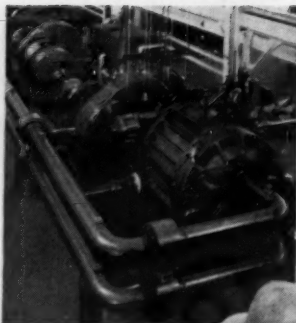
● See—STEEL WITH A THOUSAND QUALITIES—37-min., 16 mm, semi-technical, full-color, sound film on the making of steel castings. For information write: Dept. A, Lebanon Steel Foundry.

**LEBANON** **Castings**  
CARBON, SPECIAL ALLOY  
AND STAINLESS STEEL

LEBANON STEEL FOUNDRY

LEBANON, PA.

Circle 26A on reply card



4-cycle type and are especially adapted for oil-field, refinery and natural-gas applications. All their important details are shown in cross-sectional drawings, and a 5-color chart traces the paths of the fuel, exhaust gases, lubricating oil, cooling water and gas being compressed. The PSVG power unit also is described in Form 3128-A, and varied uses of the compressors are pictured.

Circle 36E on reply card

Allegheny Ludlum Steel Corporation has available a revised fifth edition of its technical information bulletin on ALX alloy tool bits for use in the cutting range between high-speed steel and carbides. It includes new information on applications, grinding, tool angles, speeds and feeds, brazing and stock sizes.

Circle 37E on reply card

Those concerned with floor maintenance may be interested in *Floors and Floor Problems*, a 24-page illustrated brochure released by The Tremco Manufacturing Company. It discusses the various types of floors, how they are built, what factors enter into their deterioration and how to take care of them.

Circle 38E on reply card

*Taylor Forge Foundation Pipe* is the title of Bulletin No. 542 published for free distribution by Taylor Forge & Pipe Works. In addition to describing the product's characteristics, it shows pile-driving operations, lists accessory equipment and gives sizes of pipe commonly used for the purpose in constructing bridges and buildings.

Circle 39E on reply card

Reusable metal storage and shipping containers, their construction and their advantages, are dealt with in a brochure—Technical Bulletin 601—released by Peters-Dalton, Inc. Also contains information about the company's engineering and manufacturing facilities for fabricating special products to meet customers' specifications.

Circle 40E on reply card

A 200-page catalogue, published by Universal Gear Works, Inc., lists specifications and prices of more than 8000 stock items including gears and sprockets from ¼ inch to 80 inches, chains, splines, etc. The company also manufactures drilling units, dust collectors and coolant systems and designs and builds machines, tools, dies, jigs, fixtures, etc.

Circle 41E on reply card

Electric Machinery Manufacturing Company has made available a reprint (No. 1120) of a paper written by the firm's chief application engineer G. L. Oscarson and presented before a recent meeting of the Centrifugal Section of the Compressed Air and Gas Institute. The 12-page booklet discusses the application of a-c motors and controls to centrifugal compressors, with special emphasis on synchronous-motor and induction-motor torque requirements for compressors of that type.

Circle 42E on reply card

A comprehensive catalogue on industrial hose and fittings, known as the Yellow Book, has been issued by The Weatherhead Company for its distributors but is also available to original equipment manufacturers. The 132-page publication contains information of value to designers of pneumatic and hydraulic control systems. There is a Technical Data Section including tube-bending instructions, correct procedures for making hose assemblies, pressure tables, etc., and another covering service equipment.

Circle 43E on reply card



**PUT AIR  
AT YOUR FINGERTIPS**



Drop-forged stainless steel—practically indestructible—simple construction—parts easily replaced—protective hand guard and hang-up hook—comfortable grip—centered nose.

Drop-Forged Brass Lever Type forged brass body—easily controlled from a saphyr to a blast—comfortable grip—parts easily replaced.

Drop-Forged Brass Button Type forged brass body—easy grip—parts easily replaced.



## Use Schrader blow guns... 36 designs and styles

Schrader Blow Guns are made to *fit your hand*... *fit your job!* Schrader Blow Guns are built to take it—here's why:

They're rugged both in design and construction. Bodies are drop-forged either of brass or stainless steel.

They're convenient—can be used anywhere. Blow gun circuits—using Schrader Couplers, Hose and Automatic Hose Reels—take little space, yet put compressed air right at your fingertips.

They're economical—they have few moving parts.

And replacement parts, when and if needed, are easily installed.

They're versatile—with nine interchangeable noses—both fixed and adjustable—that fit all three standard-type guns, you can't think of a blow-gun application that Schrader can't meet.

It's easy to find out for yourself what a wide selection of blow guns is in the complete Schrader Line of air control equipment. Write today—or, if you prefer, fill out the coupon below.

# Schrader

REG. U. S. PAT. OFF.

### SPECIAL ADJUSTABLE NOSES



### VARIOUS STANDARD NOSES



The complete Schrader line of pneumatic accessories includes everything you need

LEADERS IN AIR CONTROL SINCE 1844

#### A. SCHRADER'S SON

Division of Scovill Manufacturing Company, Incorporated  
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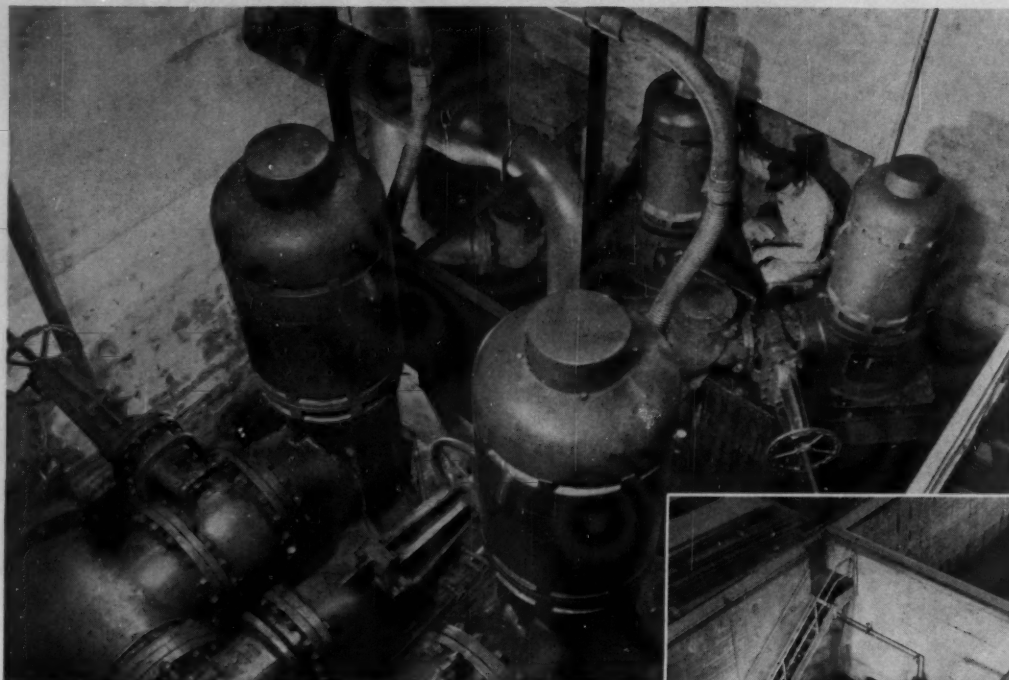
I am interested in more information on \_\_\_\_\_

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

# I-R VERTICAL PUMPS STAND UP under tough corrosive and abrasive conditions in MILL-SCALE RECOVERY SYSTEM



Close-up view of pumping pit for Pittsburgh Steel's mill scale recovery system, showing four I-R Type APH vertical turbine pumps.

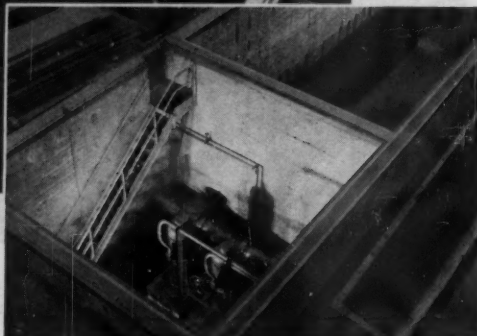
Here in Pittsburgh Steel Corporation's Allenport Plant, mill scale no longer pollutes the river. It is collected from the sluice system in a large settling tank—then scooped out and sintered to recover its valuable steel content for use in the blast furnaces.

Heart of the mill scale recovery system is the installation of I-R vertical turbine pumps shown above. Two large units recirculate settled water into the sluicing system at 6,000 gpm and 60 ft. head. The two smaller pumps, equipped with float control, discharge to another settling basin at 3,000 gpm and 40 ft. head, to prevent flooding of the pump pit.

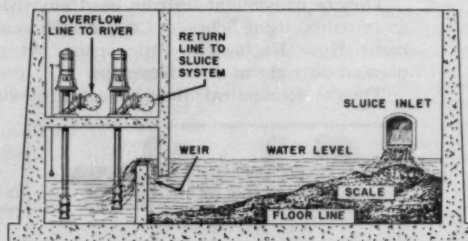
These Ingersoll-Rand pumps handle mill water containing tough abrasive scale particles. But, through extensive research by I-R chemical and metallurgical departments and field engineers, materials with the necessary corrosion-erosion resistance were developed and built into these pumps.

Similar I-R vertical pumps are giving trouble-free service at many other steel mills in the area in a cooperative effort to reduce stream pollution.

Yes—There's no job too tough for an I-R pump!



Mill scale settling tank with pump pit in foreground.



## Ingersoll-Rand

Cameron Pump Division  
11 Broadway, New York 4, N. Y.

PUMPS • CONDENSERS • TURBO-BLOWERS • COMPRESSORS • AIR AND ELECTRIC TOOLS • ROCK DRILLS

ADV. 29

Circle 28A on reply card

COMPRESSED AIR MAGAZINE

Circle 29A on reply card

# ACROSS HILLS AND VALLEYS

## Explosives Research Pays Off



Blasting trenches in hard granite formations to install a pipeline in Southern California called for engineering skill, operating know-how, and a knowledge of explosives.

Over hills and valleys and across rivers and gorges, pipelines provide safe, sure, economical means of transportation for petroleum, natural gas, water, and other mineral resources. When rock is encountered, blasting crews with specialized explosives take over. Here is where explosives research pays off.

Continuous research and extensive knowledge of field conditions have been Hercules' business for more than forty years. Hercules technical representatives welcome opportunities to discuss problems and help in the selection of the right explosives and the most efficient methods for use in mining, quarrying, construction, and exploration projects.



### HERCULES

#### HERCULES POWDER COMPANY

INCORPORATED

*Explosives Department, 932 King Street, Wilmington 99, Delaware*

*Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazelton, Pa.; Joplin, Mo.; Los Angeles, Calif.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Calif.*



# "Under Way On Nuclear Power"

As she blinked this terse message, the *USS Nautilus* cast off and steamed to sea leaving an old era of oceanic travel in its wake.

This is the first nuclear-powered, steam-turbine-driven submarine ever to be built. With the eyes of the world watching, it was a project with no margin for failure. Exhaustive sea trials which tested every feature of her equipment proved that the only acceptable result—success—had been completely realized.

We take pride in Walworth's share in this momentous achievement. For, from the days when the *Nautilus* was still on the drawing board to the last stage of construction, Walworth engineers worked directly with the Electric Boat Division of the General Dynamics Corporation—helping with the myriad of piping problems this new concept of transportation posed. Now the *Nautilus* prepares to join the fleet with Walworth Valves and Fittings, both standard and special items, installed.

We are glad to be aboard.

## WALWORTH

*Manufacturers since 1842*

**valves . . . pipe fittings . . . pipe wrenches**

60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS  
THROUGHOUT THE WORLD



# HIGH PRESSURE FORGED TRAPS

for Automatic Drainage  
of Air and Gas Systems  
at Pressures to 2000 lbs.

## 1. BALL FLOAT TRAPS

a. *Snap-Action*—to 1000 psig. Spring-powered valve snaps open and closed. No hunting or dribbling. Not held open by fine dirt.

b. *Direct Action*—to 1500 psig. Recommended where no oil or dirt are encountered.

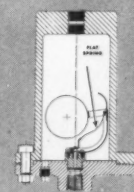
## 2. INVERTED BUCKET TRAPS

—pressures to 2000 psig. None more dependable—not adversely affected by dirt or heavy oil.

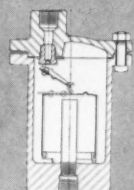
Submit your problem for detailed recommendation.

ASK FOR BULLETIN 2022

**ARMSTRONG  
MACHINE WORKS**  
885 Maple Street  
Three Rivers, Michigan



No. 71-315  
SNAP-ACTION  
BALL FLOAT TRAP

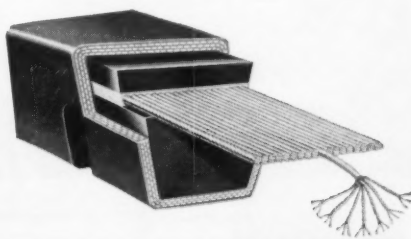


No. 313  
INVERTED BUCKET  
TRAP



**ARMSTRONG**  
*Air and Gas*  
**TRAPS**

Circle 31A on reply card



where clearances limit the  
number of v-belts  
specify **"SURE-GRIP"**  
steel cable v-belts

The number of grooves on the face of the sheave, of course, is determined by the number of belts to be used, which, in turn is determined by the HP required. In drives where clearances limit the width of the sheave face, fewer belts must be used, yet be able to withstand the same loads and speeds. Here's where "Sure-Grip" steel cable V-Belts come in.

These belts have higher HP rating due to continuous steel cables that provide super strength, practically zero stretch. Strength member lies in a single plane thus insuring long flex life. Available in A, B, C and D cross sections for medium center, heavy duty drives. For further information write for Bulletin 394.



**T. B. WOOD'S SONS COMPANY**

CHAMBERSBURG, PA.

CAMBRIDGE, MASS., NEWARK, N. J., CLEVELAND, OHIO

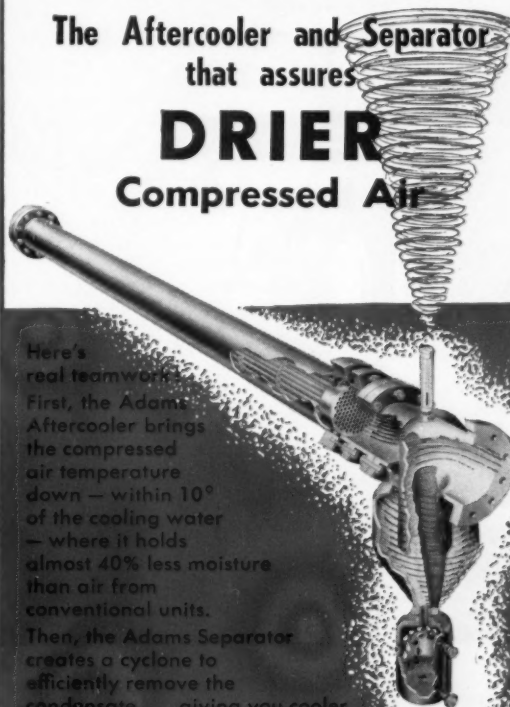
Circle 32A on reply card

APRIL, 1955

# This Adams CYCLONE Saves You MONEY!

The Aftercooler and Separator  
that assures

**DRIER**  
Compressed Air



Here's  
real teamwork

First, the Adams  
Aftercooler brings  
the compressed  
air temperature  
down — within 10°  
of the cooling water  
— where it holds  
almost 40% less moisture  
than air from  
conventional units.

Then, the Adams Separator  
creates a cyclone to  
efficiently remove the  
condensate . . . giving you cooler,  
drier air for your system.

Thousands in use throughout industry. It will  
pay you to find out all the details. Mail the  
coupon below today.

**R. P. ADAMS CO., Inc.**

Buffalo 17, New York

**R. P. ADAMS CO., INC.**

A-55

209 East Park Drive  
Buffalo 17, N. Y.

Please send my FREE copy of Bulletin No. 711 on Adams Cyclone  
Separators and Aftercoolers.

Name..... Firm.....

Street..... City..... State.....

Circle 33A on reply card

Adv. 32



Wagon drills, equipped with Bethlehem Hollow Drill Steel, removing sandstone near White Haven, Pa., for Northeast Extension of Pennsylvania Turnpike. Rods were made up and reconditioned by Howells Mining Drill Co., Plymouth, Pa.

## Removing Hard Sandstone for Turnpike Extension

One of the newest ventures in Pennsylvania's growing system of limited access highways is the Northeast Extension of the Pennsylvania Turnpike. Beginning at Plymouth Meeting, near Philadelphia, the new four-lane highway is to run northward through the anthracite region and the Pocono Mountain resort area.

The section of the new highway shown here, a 2.9-mile stretch near White Haven, called for the removal of approximately 500,000 cu yd of hard, abrasive sandstone. Using Bethlehem

Hollow Drill Steel exclusively, fitted with carbide-insert bits, the drilling crews used jackhammers and wagon drills to make blast holes 16 ft deep.

Bethlehem Hollow Drill Steel can always be counted on for steady, economical performance because it is rolled from a tough, fatigue-resisting steel. It has a wide quenching range, making it easy to heat-treat for the ideal balance of hardness and wear-resistance. Bethle-

hem Hollow also makes long-wearing threads and tough shanks. It's furnished in rounds, hexagons and quarter octagons, usually in lengths of 18 to 25 ft, though longer if specified. Any way you look at it, Bethlehem Hollow is the ideal steel for tough drilling jobs.

**BETHLEHEM STEEL COMPANY**  
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation.  
Export Distributor: Bethlehem Steel Export Corporation



## BETHLEHEM HOLLOW DRILL STEEL





AMAZINGLY SUPERIOR  
BEARING BRONZE

## BEARIUM METAL

The unique structure of Bearium Metal combines not only the best features of babbitt and bronze, but, in addition, has desirable frictional characteristics that are exclusive.

- ★ It will not melt out like babbitt.
- ★ It does not score like an ordinary bronze.
- ★ It definitely puts an end to all problems ordinarily encountered in frictional applications.

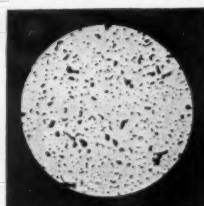
Write for Full Information on this Amazing Bearing Alloy

### BEARIUM METALS CORP.

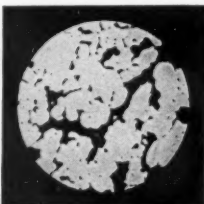
270 State St., Rochester 14, N. Y.

WEST COAST AFFILIATE:  
Nevin Engineering Associates  
932 Chautauqua Blvd.  
Pacific Palisades, Calif.

IN CANADA:  
Bearium Metals of Canada, Ltd.  
155 George St.  
Toronto 2, Canada



BEARIUM METAL magnified 25 diameters shows lead (black) in microscopic, globular form, uniformly distributed.



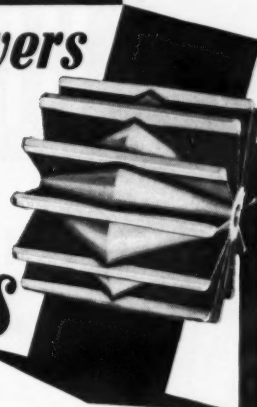
ORDINARY LEADED BRONZE at 25 diameters shows poor lead distribution, with lead between copper grains.

Circle 35A on reply card

## Super-Savers

SPROUT-WALDRON

## BELT- SAVER PULLEYS



You'll cut belt costs when handling rough, abrasive materials with Belt-Savers. Exclusive cone and wing design prevents materials from lodging between pulley and belt, increasing belt life from 50% to 400%.

You'll also get top economy and complete satisfaction with other Sprout-Waldron cast-iron pulleys that are available in many sizes and types for conveyor and transmission use.

Write for free booklets!

364



### SPROUT-WALDRON

86 LOGAN STREET • MUNCY, PA.

PELLET MILLS • HAMMER ROLLER ATTRITION AND BURR STONE MILLS  
MIXERS • SCREW BELT AND PNEUMATIC CONVEYORS • BUCKET ELEVATORS  
CUTTERS • CRUSHERS AND FEEDERS • REELS • SEPARATORS AND ASPIRATORS

Circle 36A on reply card

NO MOISTURE  
OR DIRT  
GETS BY HERE

### Johnson Self-Draining Compressed Air Separator .....

Like all Johnson Separators the new Type "SA" Self-Draining Separator combines the two most effective principles of removing moisture and dirt from compressed air:

1. Controlled expansion of air in separator precipitates most of the moisture.
2. A "thousand baffles" of coarse mesh repeatedly changes flow of direction to capture remaining foreign matter.

Self-Draining—a simple but complete trap mechanism built right in, automatically drains separator whenever necessary.

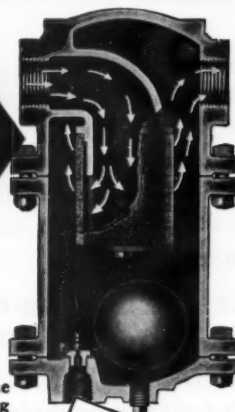
WRITE FOR CATALOG

The Johnson Corporation

830 WOOD STREET



THREE RIVERS, MICH.



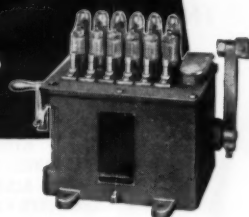
Johnson Separation Devices include Separators for Compressed Air or Steam. After coolers, oil absorbers.

Circle 37A on reply card

For Positive Automatic  
Machine Lubrication  
use

## HILLS-McCANNA

FORCE FEED  
LUBRICATORS



- Hills-McCanna Force Feed Lubricators are specially designed oil line pumps that provide a positive automatic flow of oil to even the most difficult-to-lubricate spots. Available in open or enclosed types in sizes from 2 to 32 pints with 1 to 48 feeds. Oil flow through the lubricator is exactly controllable to meet your specifications. For complete information, write for catalog L-52. Hills-McCanna Co.—2361 W. Nelson St., Chicago 18, Ill.

## HILLS-McCANNA

force feed lubricators

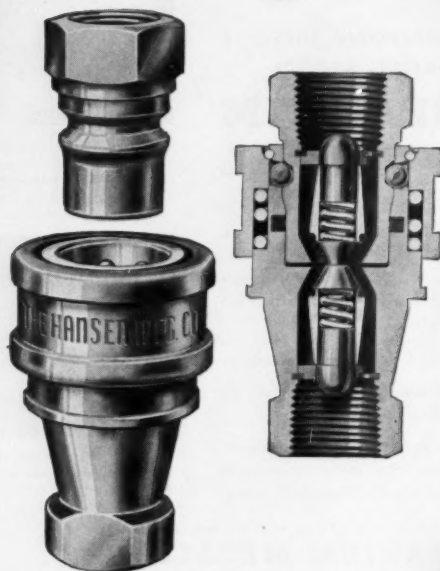
Also manufacturers of Saunders patent valves • chemical proportioning pumps • magnesium alloy sand castings.

Circle 38A on reply card

# HANSEN

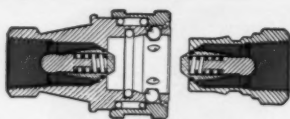
## QUICK-CONNECTIVE

# 2-WAY SHUT-OFF COUPLINGS!



**QUICK CONNECTION  
AND  
DISCONNECTION**

**INSTANT  
AUTOMATIC FLOW  
OR SHUT-OFF**



**Seals Both Ends of Line  
AUTOMATICALLY  
INSTANTANEOUSLY**

**Quick Connective  
Fluid Line Couplings for**  
AIR • OIL • GREASE • HYDRAULIC  
FLUIDS • REFRIGERANTS • STEAM  
VACUUM • OXYGEN • ACETYLENE  
GASOLINE • COOLANTS • WATER

HOSE CLAMPS • HOSE CLAMP  
PLUGS • HOSE CLAMP SOCKETS  
HOSE CLAMP COUPLINGS • AIR  
LIQUID SPRAY GUNS • AIR BLOW  
GUNS • SAND BLAST CLEANERS  
ENGINE CLEANERS

SINCE 1915



## THE HANSEN

**QUICK-CONNECTIVE FLUID LINE COUPLINGS**

## MANUFACTURING COMPANY

4031 WEST 150th STREET

CLEVELAND 11, OHIO

To connect a Hansen Two-Way Shut-Off Coupling, you just pull back the sleeve and push the Plug into the Socket. To disconnect, merely pull back sleeve. No tools required. Similar valves in Socket and Plug shut off both ends of line when Coupling is disconnected—practically eliminate spilling of liquid or escape of gas at instant of disconnection.

### FEMALE PIPE THREAD CONNECTIONS FROM 1/8" TO 1"

Hansen Series HK Two-Way Shut-Off Couplings are available with female pipe thread connections from 1/8" to 1" inclusive. Available in brass or steel.

*Also Straight-Through and One-Way  
Shut-Off Couplings. Write for Catalog.*

REPRESENTATIVES IN PRINCIPAL CITIES



## Underground Life Lines of Manhattan

*Third Lincoln Tube now brings total to 41...  
drilled with Ingersoll-Rand equipment*

**T**WENTY vehicular tunnels now link Manhattan with the mainland, New Jersey and Long Island. Each tunnel consists of two separate bores. A third bore now being added to the Lincoln Tunnel will bring the total to 41. It will also keep Ingersoll-Rand's 79-year-old record intact. For here, as on all other Manhattan tubes since the very first one, Ingersoll-Rand drills have been used on the rock work.

The western end of this new Lincoln tube calls for driving through rock approximately 750 ft. of 34 ft. circular tunnel. It is being driven in two sections from the bottom of a shaft 130 ft. deep. After careful consideration of all modern tun-

nel driving methods, I-R Jackdrills and 1 3/8" Carset Jackbits were selected for driving the top heading. The bench will be driven by Ingersoll-Rand Wagon Drills.

When it comes to drilling rock, remember that I-R can supply everything you need from the bit all the way back to the compressor. Let your Ingersoll-Rand representative help plan your next rock job. His experience may be of great value to you.

5-91



# Ingersoll-Rand

11 Broadway, New York 4, N. Y.

ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • PUMPS • OIL & GAS ENGINES

Circle 40A on reply card

1. Independent Subway
2. Interboro Rapid Transit
3. Interboro Rapid Transit
4. Brooklyn-Manhattan Transit
5. Independent Subway
6. Interboro Rapid Transit
7. Queens Midtown
8. Long Island RR
9. Brooklyn-Manhattan Transit
10. Independent Subway
11. Independent Subway
12. Interboro Rapid Transit
13. Brooklyn-Manhattan Transit
14. Interboro Rapid Transit
15. Brooklyn Battery Tunnel
16. Hudson & Manhattan RR
17. Holland Tunnel
18. Hudson & Manhattan RR
19. Pennsylvania RR
20. Lincoln Tunnel



# Provides vacuum for making lamp bulbs ... with help of TIMKEN® bearings

**P**ICTURED below is one of two Ingersoll-Rand ES-1 compressors used as single-stage vacuum pumps in a modern lamp factory. They provide a 26" mercury vacuum for evacuating lamp bulbs. And since any compressor failure would slow production to a walk, every precaution is taken to prevent breakdowns and keep maintenance delays to a minimum. One important way these compressors are kept on the go: crankshafts are mounted on Timken® tapered roller bearings.

The tapered design of Timken bearings lets them take both radial and thrust loads, holds crankshaft in positive alignment. Result: wear on adjacent parts is reduced. Crankshaft wear is eliminated because there is no friction between it and the bearing. And friction within the bearing is practically eliminated due to the true rolling motion and incredibly smooth surface finish of Timken bearings.

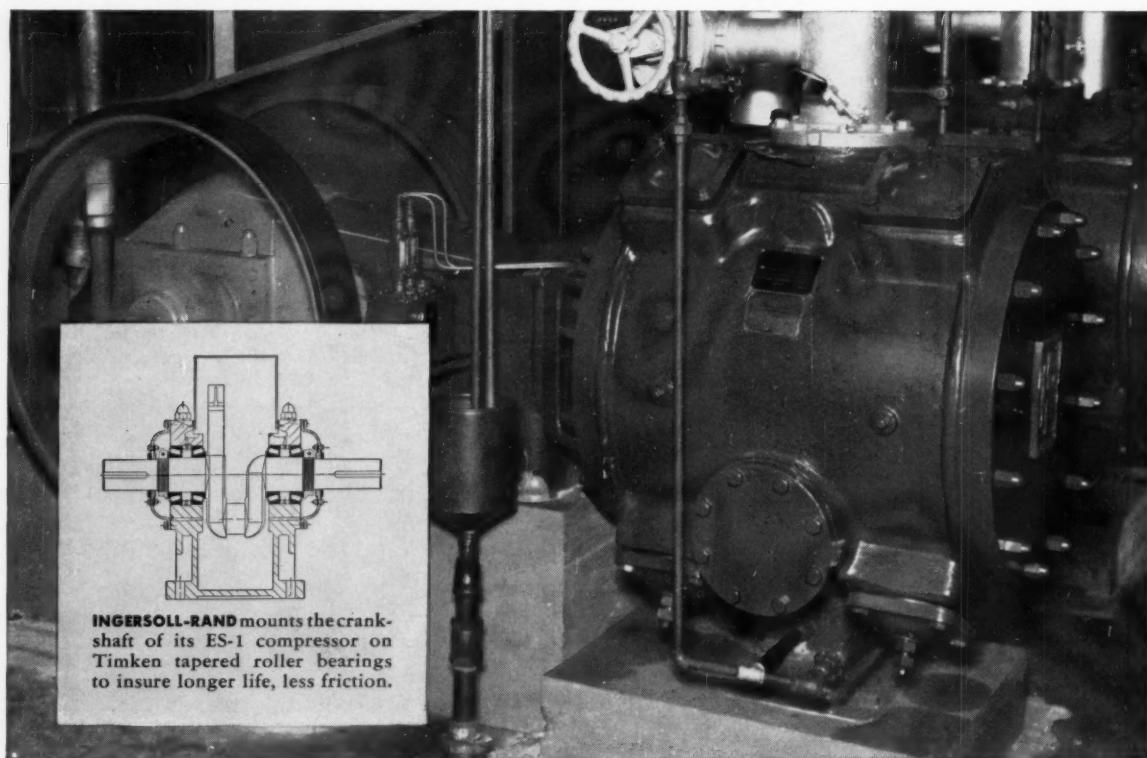
Timken bearings hold housings and shafts concentric, making clo-

sures more effective. Dirt and moisture are kept out—lubricant is kept in. Lubrication and maintenance costs are held to a minimum.

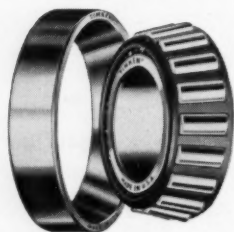
Be sure to specify Timken bearings for the machinery you build or buy. Look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".



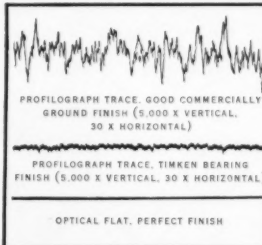
*This symbol on a product means its bearings are the best.*



**INGERSOLL-RAND** mounts the crankshaft of its ES-1 compressor on Timken tapered roller bearings to insure longer life, less friction.



**TIMKEN**  
TRADE-MARK REG. U. S. PAT. OFF.  
**TAPERED ROLLER BEARINGS**



## SMOOTH TO MILLIONTHS OF AN INCH

Surface finish of high quality Timken bearing rollers and races is so smooth that it takes a profilograph to measure its smoothness. This instrument measures surface variations to a millionth of an inch, as shown at the left.

NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Circle 41A on reply card